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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification <sup>6</sup> : C07D 471/04, 487/04, A61K 31/44, 31/505 // (C07D 471/04, 249:00, 221:00) (C07D 487/04, 249:00, 239:00) (C07D 487/04, 239:00, 231:00)</p>	<p>A1</p>	<p>(11) International Publication Number: <b>WO 99/11643</b></p> <p>(43) International Publication Date: 11 March 1999 (11.03.99)</p>
<p>(21) International Application Number: PCT/US98/18080</p> <p>(22) International Filing Date: 1 September 1998 (01.09.98)</p> <p>(30) Priority Data: 60/057,432 2 September 1997 (02.09.97) US</p> <p>(71) Applicant: DU PONT PHARMACEUTICALS COMPANY [US/US]; 1007 Market Street, Wilmington, DE 19898 (US).</p> <p>(72) Inventors: ARVANITIS, Argyrios, G.; 101 Willow Glen Drive, Kennett Square, PA 19348 (US). GILLIGAN, Paul, J.; 2629 Pennington Drive, Wilmington, DE 19810 (US). BECK, James, P.; 983 Tamara Drive, Smyrna, DE 19977 (US). BAKTHAVATCHALAM, Rajagopal; 125 Berry Drive, Wilmington, DE 19808 (US).</p> <p>(74) Agent: O'BRIEN, Maureen, P.; Du Pont Pharmaceuticals Company, Legal Patent Records Center, 1007 Market Street, Wilmington, DE 19898 (US).</p>	<p>(81) Designated States: AU, BR, CA, CN, CZ, EE, HU, IL, JP, KR, LT, LV, MX, NO, NZ, PL, RO, SG, SI, SK, UA, VN, Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p><b>Published</b> <i>With international search report.</i></p>	
<p>(54) Title: HETEROCYCLYL-SUBSTITUTED RING-FUSED PYRIDINES AND PYRIMIDINES AS CORTICOTROPIN RELEASING HORMONE (CRH) ANTAGONISTS, USEFUL FOR TREATING CNS AND STRESS-RELATED DISORDERS</p> <div> <p>(I)</p> </div> <p>(57) Abstract</p> <p>Corticotropin releasing factor (CRF) antagonists of formula (I) and their use in treating psychiatric disorders and neurological diseases, anxiety-related disorders, post-traumatic stress disorder, supranuclear palsy and feeding disorders as well as treatment of immunological, cardiovascular or heart-related diseases and colonic hypersensitivity associated with psychopathological disturbance and stress in mammals.</p>		
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TITLE

HETEROCYCLYL-SUBSTITUTED RING-FUSED PYRIDINES AND  
PYRIMIDINES AS CORTICOTROPIN RELEASING HORMONE (CRH)  
ANTAGONISTS, USEFUL FOR TREATING CNS AND STRESS-RELATED  
DISORDERS

5

FIELD OF THE INVENTION

The present invention relates to novel compounds,  
pharmaceutical compositions, and methods for the  
treatment of psychiatric disorders and neurological  
diseases, including major depression, anxiety-related  
disorders, post-traumatic stress disorder, supranuclear  
palsy and feeding disorders, as well as treatment of  
immunological, cardiovascular or heart-related diseases  
and colonic hypersensitivity associated with  
psychopathological disturbance and stress. In  
particular, the present invention relates to novel  
heterocyclyl-substituted ring-fused pyridine and  
pyrimidine compounds, pharmaceutical compositions  
containing such compounds and methods of use in  
treating psychiatric disorders, neurological diseases,  
immunological, cardiovascular or heart-related diseases  
and colonic hypersensitivity associated with  
psychopathological disturbance and stress, by  
administration of the compounds of the invention.

30

BACKGROUND OF THE INVENTION

Corticotropin releasing factor (herein referred  
to as CRF), a 41 amino acid peptide, is the primary  
physiological regulator of proopiomelanocortin(POMC)  
-derived peptide secretion from the anterior  
pituitary gland [J. Rivier et al., *Proc. Nat. Acad.*  
*Sci. (USA)* 80:4851 (1983); W. Vale et al., *Science*  
213:1394 (1981)]. In addition to its endocrine role  
at the pituitary gland, immunohistochemical  
localization of CRF has demonstrated that the  
hormone has a broad extrahypothalamic distribution

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in the central nervous system and produces a wide spectrum of autonomic, electrophysiological and behavioral effects consistent with a neurotransmitter or neuromodulator role in brain

5 [W. Vale et al., *Rec. Prog. Horm. Res.* 39:245 (1983); G.F. Koob, *Persp. Behav. Med.* 2:39 (1985); E.B. De Souza et al., *J. Neurosci.* 5:3189 (1985)]. There is also evidence that CRF plays a significant role in integrating the response of the immune

10 system to physiological, psychological, and immunological stressors [J.E. Blalock, *Physiological Reviews* 69:1 (1989); J.E. Morley, *Life Sci.* 41:527 (1987)].

Clinical data provide evidence that CRF has a

15 role in psychiatric disorders and neurological diseases including depression, anxiety-related disorders and feeding disorders. A role for CRF has also been postulated in the etiology and pathophysiology of Alzheimer's disease, Parkinson's

20 disease, Huntington's disease, progressive supranuclear palsy and amyotrophic lateral sclerosis as they relate to the dysfunction of CRF neurons in the central nervous system [for review see E.B. De Souza, *Hosp. Practice* 23:59 (1988)].

25 In affective disorder, or major depression, the concentration of CRF is significantly increased in the cerebral spinal fluid (CSF) of drug-free individuals [C.B. Nemeroff et al., *Science* 226:1342 (1984); C.M. Banki et al., *Am. J. Psychiatry* 144:873 (1987); R.D. France et al., *Biol. Psychiatry* 28:86 (1988); M. Arato et al., *Biol Psychiatry* 25:355 (1989)]. Furthermore, the density of CRF receptors is significantly decreased in the frontal cortex of suicide victims, consistent with a hypersecretion of

30 CRF [C.B. Nemeroff et al., *Arch. Gen. Psychiatry* 45:577 (1988)]. In addition, there is a blunted adrenocorticotropin (ACTH) response to CRF (i.v.

35

administered) observed in depressed patients [P.W. Gold et al., *Am J. Psychiatry* 141:619 (1984); F. Holsboer et al., *Psychoneuroendocrinology* 9:147 (1984); P.W. Gold et al., *New Eng. J. Med.* 314:1129 (1986)]. Preclinical studies in rats and non-human primates provide additional support for the hypothesis that hypersecretion of CRF may be involved in the symptoms seen in human depression [R.M. Sapolsky, *Arch. Gen. Psychiatry* 46:1047 (1989)]. There is preliminary evidence that tricyclic antidepressants can alter CRF levels and thus modulate the numbers of CRF receptors in brain [Grigoriadis et al., *Neuropsychopharmacology* 2:53 (1989)].

There has also been a role postulated for CRF in the etiology of anxiety-related disorders. CRF produces anxiogenic effects in animals and interactions between benzodiazepine / non-benzodiazepine anxiolytics and CRF have been demonstrated in a variety of behavioral anxiety models [D.R. Britton et al., *Life Sci.* 31:363 (1982); C.W. Berridge and A.J. Dunn *Regul. Peptides* 16:83 (1986)]. Preliminary studies using the putative CRF receptor antagonist  $\alpha$ -helical ovine CRF (9-41) in a variety of behavioral paradigms demonstrate that the antagonist produces "anxiolytic-like" effects that are qualitatively similar to the benzodiazepines [C.W. Berridge and A.J. Dunn *Horm. Behav.* 21:393 (1987), *Brain Research Reviews* 15:71 (1990)]. Neurochemical, endocrine and receptor binding studies have all demonstrated interactions between CRF and benzodiazepine anxiolytics providing further evidence for the involvement of CRF in these disorders.

Chlordiazepoxide attenuates the "anxiogenic" effects of CRF in both the conflict test [K.T. Britton et al., *Psychopharmacology* 86:170 (1985); K.T. Britton

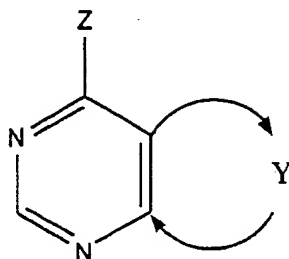
et al., *Psychopharmacology* 94:306 (1988)] and in the acoustic startle test [N.R. Swerdlow et al., *Psychopharmacology* 88:147 (1986)] in rats. The benzodiazepine receptor antagonist (Ro15-1788), which was without behavioral activity alone in the operant conflict test, reversed the effects of CRF in a dose-dependent manner while the benzodiazepine inverse agonist (FG7142) enhanced the actions of CRF [K.T. Britton et al., *Psychopharmacology* 94:306 (1988)].

The mechanisms and sites of action through which the standard anxiolytics and antidepressants produce their therapeutic effects remain to be elucidated. It has been hypothesized however, that they are involved in the suppression of the CRF hypersecretion that is observed in these disorders. Of particular interest is that preliminary studies examining the effects of a CRF receptor antagonist ( $\alpha$ -helical CRF9-41) in a variety of behavioral paradigms have demonstrated that the CRF antagonist produces "anxiolytic-like" effects qualitatively similar to the benzodiazepines [for review see G.F. Koob and K.T. Britton, In: *Corticotropin-Releasing Factor: Basic and Clinical Studies of a Neuropeptide*, E.B. De Souza and C.B. Nemeroff eds., CRC Press p221 (1990)].

Several publications describe corticotropin releasing factor antagonist compounds and their use to treat psychiatric disorders and neurological diseases. Examples of such publications include DuPont Merck PCT application US94/11050, Pfizer WO 95/33750, Pfizer WO 95/34563, Pfizer WO 95/33727 and Pfizer EP 0778 277 A1.

PCT Patent Application WO 96/40142 discloses compounds useful in treatment of hyperproliferative

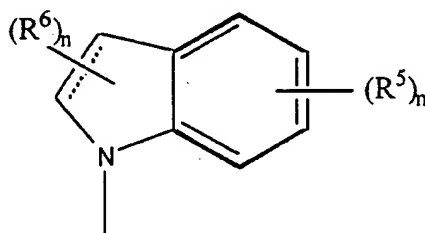
diseases such as cancers and acnes, having the general formula shown below,



5

wherein Z is  $\text{NR}^1\text{R}^2$  and  $\text{R}^1$  is H and  $\text{R}^2$  is phenyl substituted by  $(\text{R}^5)_m$  or Q or  $\text{R}^1\text{R}^2\text{N}$  is a group of the

10 formula



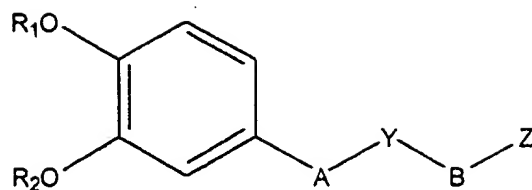
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PCT Patent Application WO 97/27199-A discloses 7H-pyrrolo[2,3-d]pyrimidine derivatives which are useful in treatment of cardiovascular disease, cerebrovascular disease and renal disease.

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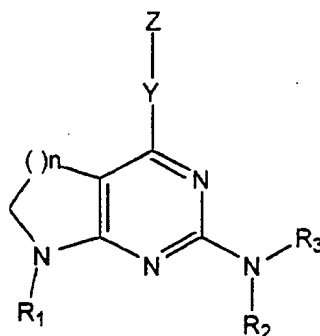
EP Patent Application EP0706795 discloses catechol diether compounds as inhibitors of tumor necrosis factor release, having the general formula shown below

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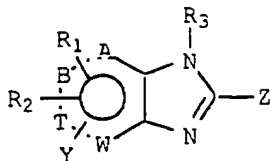
5 wherein Z can be benzimidazole substituted with quinoline. However, compounds of this type are not included in the compounds of the present invention.

U.S. Patent No. 5,378,700 discloses fused  
 10 pyrimidine derivatives useful for treatment of hypoxemia associated with respiratory diseases, having the general formula shown below



15 wherein Y and Z together represent a fused biheterocyclic ring which has 1-3 N in any position being bonded via the N-atom to the 4-position of the pyrimidine. However, compounds of this type are not  
 20 included in the compounds of the present invention.

CA Patent No. 2,011,222 discloses benzimidazole and azabenzimidazole derivatives useful  
 for treatment of cardiovascular diseases and duodenal  
 25 ulcers, having the general formula shown below



wherein Y can be benzimidazole and Z can be phenyl  
or pyridyl. However, those compounds are not  
5 included in the compounds of the invention.

Insofar as is known, novel triazolopyridines  
and pyrimidines, which are described in detail  
below, have not been previously reported as  
10 corticotropin releasing factor antagonist compounds  
useful in the treatment of psychiatric disorders and  
neurological disease, including major depression,  
anxiety-related disorders, post-traumatic stress  
disorder, supranuclear palsy and feeding disorders  
15 as well as treatment of immunological,  
cardiovascular or heart-related diseases and colonic  
hypersensitivity associated with psychopathological  
disturbance and stress.

## 20 SUMMARY OF THE INVENTION

In accordance with one aspect, the present  
invention provides novel compounds which bind to  
corticotropin releasing factor receptors, thereby  
altering the anxiogenic effects of CRF secretion.  
25 The compounds of the present invention are useful  
for the treatment of psychiatric disorders and  
neurological diseases, anxiety-related disorders,  
post-traumatic stress disorder, supranuclear palsy  
and feeding disorders as well as treatment of  
30 immunological, cardiovascular or heart-related  
diseases and colonic hypersensitivity associated  
with psychopathological disturbance and stress in  
mammals.

According to another aspect, the present invention provides novel compounds of formula (I) (described below) which are useful as antagonists of the corticotropin releasing factor. The compounds of the present invention exhibit activity as corticotropin releasing factor antagonists and appear to suppress CRF hypersecretion. The present invention also includes pharmaceutical compositions containing such compounds of formula (I), and methods of using such compounds for the suppression of CRF hypersecretion, and/or for the treatment of anxiogenic disorders.

According to yet another aspect, the present invention provides novel compounds, pharmaceutical compositions and methods which may be used in the treatment of affective disorder, anxiety, depression, irritable bowel syndrome, post-traumatic stress disorder, supranuclear palsy, immune suppression, Alzheimer's disease, gastrointestinal disease, anorexia nervosa or other feeding disorder, drug or alcohol withdrawal symptoms, drug addiction, inflammatory disorder, fertility problems, disorders, the treatment of which can be effected or facilitated by antagonizing CRF, including but not limited to disorders induced or facilitated by CRF, or a disorder selected from inflammatory disorders such as rheumatoid arthritis and osteoarthritis, pain, asthma, psoriasis and allergies; generalized anxiety disorder; panic, phobias, obsessive-compulsive disorder; post-traumatic stress disorder; sleep disorders induced by stress; pain perception such as fibromyalgia; mood disorders such as depression, including major depression, single episode depression, recurrent depression, child abuse induced depression, and postpartum depression; dysthemia; bipolar disorders; cyclothymia; fatigue

syndrome; stress-induced headache; cancer, human immunodeficiency virus (HIV) infections; neurodegenerative diseases such as Alzheimer's disease, Parkinson's disease and Huntington's disease; gastrointestinal diseases such as ulcers, irritable bowel syndrome, Crohn's disease, spastic colon, diarrhea, and post operative ilius and colonic hypersensitivity associated by psychopathological disturbances or stress; eating disorders such as anorexia and bulimia nervosa; hemorrhagic stress; stress-induced psychotic episodes; euthyroid sick syndrome; syndrome of inappropriate antidiarrhetic hormone (ADH); obesity; infertility; head traumas; spinal cord trauma; ischemic neuronal damage (e.g., cerebral ischemia such as cerebral hippocampal ischemia); excitotoxic neuronal damage; epilepsy; cardiovascular and hear related disorders including hypertension, tachycardia and congestive heart failure; stroke; immune dysfunctions including stress induced immune dysfunctions (e.g., stress induced fevers, porcine stress syndrome, bovine shipping fever, equine paroxysmal fibrillation, and dysfunctions induced by confinement in chickens, sheering stress in sheep or human-animal interaction related stress in dogs); muscular spasms; urinary incontinence; senile dementia of the Alzheimer's type; multiinfarct dementia; amyotrophic lateral sclerosis; chemical dependencies and addictions (e.g., dependencies on alcohol, cocaine, heroin, benzodiazepines, or other drugs); drug and alcohol withdrawal symptoms; osteoporosis; psychosocial dwarfism and hypoglycemia in mammals.

According to a still further aspect of the invention, the compounds provided by this invention (and especially labelled compounds of this



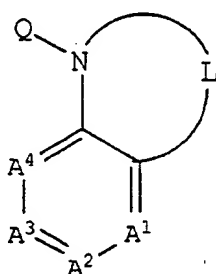
invention) are also useful as standards and reagents in determining the ability of a potential pharmaceutical to bind to the CRF receptor.

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DETAILED DESCRIPTION OF THE INVENTION

[1] Thus, in a first embodiment, the present invention provides a novel compound of formula I:

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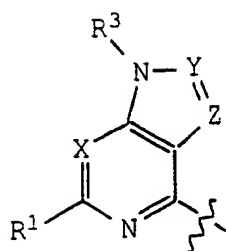
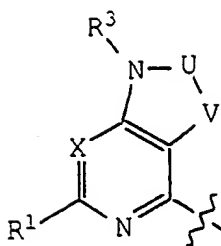
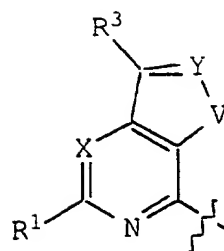
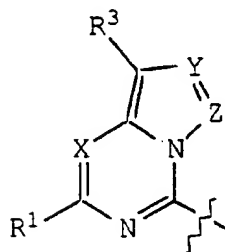
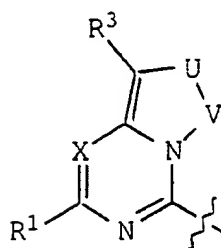
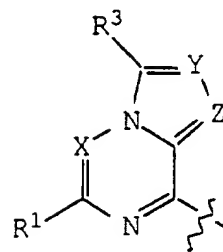


(I)

15 and isomers thereof, stereoisomeric forms thereof, or mixtures of stereoisomeric forms thereof, and pharmaceutically acceptable salt forms thereof wherein:

Q is selected from the group consisting of:

20

**Ia****Ib****Ic****IIa****IIb****IIc**

X is N or CR<sup>1</sup>;

5

Y, Z are independently N or CR<sup>2</sup>;

U, V are independently >C=G, CR<sup>13</sup>R<sup>14</sup>, or NR<sup>13</sup>, O, or  
S without forming O-O, S-O, or S-S bonds;

10

G is O or S;

R<sup>1</sup> is independently at each occurrence -H, halogen,  
-CN, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>COR<sup>9</sup>, -  
15 COR<sup>10</sup>, -OR<sup>10</sup>, SH or -S(O)<sub>n</sub>R<sup>12</sup>, C<sub>1</sub>-C<sub>6</sub> alkyl,  
C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl,  
C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, where each C<sub>1</sub>-C<sub>6</sub> alkyl,  
C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl,  
C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl is each optionally  
20 substituted with halogen, -CN, C<sub>1</sub>-C<sub>4</sub> haloalkyl,  
-NR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>COR<sup>9</sup>, -COR<sup>10</sup>, -OR<sup>10</sup>, SH or  
-S(O)<sub>n</sub>R<sup>12</sup>;

R<sup>2</sup> is -H, halogen, -CN, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NR<sup>9</sup>R<sup>10</sup>,

-NR<sup>9</sup>COR<sup>9</sup>, -COR<sup>10</sup>, -OR<sup>10</sup>, SH or -S(O)<sub>n</sub>R<sup>12</sup>,  
 C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl,  
 C<sub>3</sub>-C<sub>7</sub> cycloalkylalkyl, each optionally  
 substituted with halogen, CN, C<sub>1</sub>-C<sub>4</sub> haloalkyl,  
 5 -NR<sup>9</sup>R<sup>10</sup>, NR<sup>9</sup>COR<sup>9</sup>, -COR<sup>10</sup>, -OR<sup>10</sup>, SH or  
 -S(O)<sub>n</sub>R<sup>12</sup>;

R<sup>3</sup> is C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl,  
 C<sub>3</sub>-C<sub>8</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, C<sub>2</sub>-  
 10 C<sub>10</sub> alkoxyalkyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenyl, C<sub>5</sub>-C<sub>10</sub>  
 cycloalkenylalkyl, where one carbon in any  
 cycloalkyl ring may be replaced with O, S or  
 NR<sup>9</sup> and each C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl,  
 C<sub>2</sub>-C<sub>8</sub> alkynyl, C<sub>3</sub>-C<sub>8</sub> cycloalkyl,  
 15 C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>10</sub> alkoxyalkyl,  
 C<sub>5</sub>-C<sub>10</sub> cycloalkenyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenylalkyl  
 is optionally substituted with 1 to 3  
 substituents independently selected at each  
 occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-  
 20 C<sub>10</sub> alkynyl,  
 C<sub>3</sub>-C<sub>6</sub> cycloalkyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl,  
 cyano, -OR<sup>7</sup>, SH, -S(O)<sub>n</sub>R<sup>11</sup>, -COR<sup>6</sup>, -NHR<sup>6</sup>SO<sub>2</sub>R<sup>8</sup>,  
 -OC(O)NR<sup>6</sup>R<sup>7</sup>, -N<sub>3</sub>, -OC(O)OR<sup>7</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>6</sup>,  
 -NR<sup>7</sup>COR<sup>6</sup>, -N(COR<sup>6</sup>)<sub>2</sub>, -NR<sup>7</sup>CONR<sup>6</sup>R<sup>7</sup>, -NR<sup>7</sup>CO<sub>2</sub>R<sup>8</sup>,  
 25 -NR<sup>6</sup>R<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>H, aryl, heteroaryl and  
 heterocyclyl  
 or  
 -OR<sup>3a</sup>, -NR<sup>3a</sup>R<sup>3b</sup>, -NHR<sup>3a</sup>, -SO<sub>n</sub>R<sup>3a</sup>, -SO<sub>2</sub>NHR<sup>3a</sup>,  
 -SO<sub>2</sub>NR<sup>3a</sup>R<sup>3b</sup>, -COR<sup>3a</sup>, -CONHR<sup>3a</sup>, -CONR<sup>3a</sup>R<sup>3b</sup>;

30 R<sup>3a</sup> and R<sup>3b</sup> are C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl,  
 C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>8</sub> cycloalkyl,  
 C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>10</sub> alkoxyalkyl,  
 C<sub>5</sub>-C<sub>10</sub> cycloalkenyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenylalkyl,  
 35 where one carbon in any cycloalkyl may be  
 replaced with O, S or NR<sup>9</sup> and each C<sub>1</sub>-  
 C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl,

C<sub>3</sub>-C<sub>8</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>10</sub> alkoxyalkyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenylalkyl is optionally substituted with 1 to 3 substituents independently selected at each occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>7</sup>, -SH, -S(O)<sub>n</sub>R<sup>11</sup>, -COR<sup>6</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>6</sup>, -NR<sup>7</sup>COR<sup>6</sup>, -N(COR<sup>6</sup>)<sub>2</sub>, -NR<sup>7</sup>CONR<sup>6</sup>R<sup>7</sup>, -NR<sup>7</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>6</sup>R<sup>7</sup>, -NHR<sup>6</sup>SO<sub>2</sub>R<sup>8</sup>, -OC(O)NR<sup>6</sup>R<sup>7</sup>, -N<sub>3</sub>, -OC(O)OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>H, aryl, heteroaryl and heterocyclyl;

L is a two to four atom saturated or partially unsaturated linker group optionally containing one to two B groups and in which one to two carbons of L may be >C=O or >C=S, where L may be substituted with one to three R<sup>4</sup> groups;

R<sup>4</sup> is independently selected in each occurrence -H, -OR<sup>10</sup>, -COR<sup>9</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CONR<sup>9</sup>R<sup>10</sup>, -CN, -NR<sup>9</sup>R<sup>10</sup>, -S(O)<sub>n</sub>R<sup>12</sup>, halogen, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, aryl or heteroaryl, wherein C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, are optionally substituted with the following functional groups: -OR<sup>10</sup>, -COR<sup>9</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CONR<sup>9</sup>R<sup>10</sup>, -CN, -NR<sup>9</sup>R<sup>10</sup>, -S(O)<sub>n</sub>R<sup>12</sup>, halogen;

B is O, S(O)<sub>n</sub> or NR<sup>9</sup>;

A<sup>1</sup>-A<sup>4</sup> are independently CR<sup>5</sup>, or up to two of A<sup>1</sup>-A<sup>4</sup> can be N;

R<sup>5</sup> is independently at each occurrence -H,

C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>1</sub>-C<sub>4</sub> haloalkoxy, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, -NO<sub>2</sub>, halogen, -CN, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>COR<sup>7</sup>, -NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup>-OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO(NOR<sup>9</sup>)R<sup>11</sup>, -CO<sub>2</sub>R<sup>8</sup>, or -S(O)<sub>n</sub>R<sup>11</sup>, where C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl and C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl are optionally substituted with 1 to 3 substituents independently selected at each occurrence from C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>2</sub>-C<sub>4</sub> alkenyl, C<sub>2</sub>-C<sub>4</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NO<sub>2</sub>, halogen, -CN, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>COR<sup>7</sup>, NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup>-OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CO(NOR<sup>9</sup>)R<sup>7</sup>, or -S(O)<sub>n</sub>R<sup>11</sup> and wherein two adjacent R<sup>5</sup> groups can form a 5-7 membered ring saturated or unsaturated optionally containing 1-2 O or SO<sub>n</sub> or 1-3 N heteroatoms optionally substituted with C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NO<sub>2</sub>, halogen, -CN, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>COR<sup>7</sup>, -NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup>-OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CO(NOR<sup>9</sup>)R<sup>7</sup>, or -S(O)<sub>n</sub>R<sup>11</sup> and not containing any S-S, O-O, S-O or N-S bonds in the ring;

R<sup>6</sup> and R<sup>7</sup> are independently at each occurrence H, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>2</sub>-C<sub>8</sub> alkoxyalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, C<sub>5</sub>-C<sub>12</sub> bis(alkoxy)alkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub> alkyl)-, heteroaryl or heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl) or NR<sup>6</sup>R<sup>7</sup> is piperidine, pyrrolidine, piperazine, N-methylpiperazine, morpholine or thiomorpholine;

- $R^8$  is independently at each occurrence C<sub>1</sub>-C<sub>4</sub> alkyl,  
C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl,  
C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub>  
alkyl), heteroaryl or heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl);
- 5  
 $R^9$  and  $R^{10}$  are independently at each occurrence  
selected from H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl,  
C<sub>3</sub>-C<sub>6</sub> alkenyl, C<sub>3</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl,  
C<sub>2</sub>-C<sub>6</sub> alkoxyalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl;
- 10  
 $R^{11}$  is independently at each occurrence C<sub>1</sub>-C<sub>4</sub> alkyl,  
C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl,  
C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub>  
alkyl), heteroaryl, heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl), or
- 15  
-NR<sup>6</sup>R<sup>7</sup>;
- $R^{12}$  is independently at each occurrence C<sub>1</sub>-C<sub>4</sub> alkyl,  
C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> alkenyl, C<sub>3</sub>-C<sub>6</sub> alkynyl,  
C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl;
- 20  
 $R^{13}$  and  $R^{14}$ , are independently at each occurrence H,  
C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl,  
C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub>  
alkyl), heteroaryl or heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl)-,
- 25  
-COR<sup>12</sup>,  
-CO<sub>2</sub>R<sup>8</sup>, -CONR<sup>9</sup>, S(O)<sub>n</sub>R<sup>12</sup>;
- aryl is phenyl or naphthyl, each optionally  
substituted with 1 to 3 substituents
- 30  
independently selected at each occurrence from  
C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub>  
cycloalkylalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl,  
halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>10</sup>, -SH,  
-S(O)<sub>n</sub>R<sup>12</sup>, -COR<sup>12</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>12</sup>, -NR<sup>9</sup>COR<sup>9</sup>,
- 35  
-N(COR<sup>12</sup>)<sub>2</sub>, -NR<sup>9</sup>CONR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>9</sup>R<sup>10</sup>,  
and -CONR<sup>9</sup>R<sup>10</sup>;

heteroaryl is pyridyl, pyrimidinyl, pyrazinyl,  
pyridazinyl, triazinyl, furanyl, quinolinyl,  
isoquinolinyl, thienyl, imidazolyl, thiazolyl,  
indolyl, pyrrolyl, oxazolyl, benzofuranyl,  
5 benzothienyl, benzthiazolyl, isoxazolyl,  
pyrazolyl, triazolyl, tetrazolyl, or indazolyl,  
each optionally substituted with 1 to 3  
substituents independently selected at each  
occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl,  
10 C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub>  
alkynyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano,  
-OR<sup>10</sup>, -SH, -S(O)<sub>n</sub>R<sup>12</sup>, -COR<sup>12</sup>, -CO<sub>2</sub>R<sup>8</sup>,  
-OC(O)R<sup>12</sup>, -NR<sup>9</sup>COR<sup>9</sup>, -N(COR<sup>12</sup>)<sub>2</sub>, -NR<sup>9</sup>CONR<sup>9</sup>R<sup>10</sup>,  
-NR<sup>9</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>9</sup>R<sup>10</sup>, and -CONR<sup>9</sup>R<sup>10</sup>;

15 heterocyclyl is saturated or partially saturated  
heteroaryl, optionally substituted with 1 to 3  
substituents independently selected at each  
occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl,  
20 C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub>  
alkynyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -  
OR<sup>10</sup>, SH, -S(O)<sub>n</sub>R<sup>12</sup>, -COR<sup>12</sup>, -CO<sub>2</sub>R<sup>12</sup>, -  
OC(O)R<sup>12</sup>,  
-NR<sup>9</sup>COR<sup>9</sup>, -N(COR<sup>12</sup>)<sub>2</sub>, -NR<sup>9</sup>CONR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>CO<sub>2</sub>R<sup>12</sup>,  
25 -NR<sup>9</sup>R<sup>10</sup>, and -CONR<sup>9</sup>R<sup>10</sup>;

n is independently at each occurrence 0, 1 or 2

provided that:

- 30 (a) when Q is I<sub>a</sub>, I<sub>b</sub> or I<sub>c</sub> and X is N, R<sup>1</sup> is not  
H; and  
(b) R<sup>1</sup> is other than O-alkynyl or S-alkynyl;

[2] In a preferred embodiment, the present invention  
35 provides a novel compound of formula I, wherein:

Q is I<sub>a</sub>, I<sub>b</sub>, I<sub>c</sub>;

X is N or CR<sup>1</sup>;

Y, Z are independently N or CR<sup>2</sup>;

5

U, V are >C=G, CR<sup>13</sup>R<sup>14</sup>, or NR<sup>13</sup>, O, or S without forming O-O, S-O, or S-S bonds;

G is O;

10

R<sup>1</sup> is independently at each occurrence H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, halogen, -CN, -NR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>COR<sup>10</sup>, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -COR<sup>10</sup>, -OR<sup>10</sup> or -S(O)<sub>n</sub>R<sup>12</sup>;

15 R<sup>2</sup> is independently at each occurrence -H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, halogen, -CN, -NR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>COR<sup>10</sup>, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -COR<sup>10</sup>, -OR<sup>10</sup> or -S(O)<sub>n</sub>R<sup>12</sup>;

20 R<sup>3</sup> is C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>8</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>10</sub> alkoxyalkyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenylalkyl, where one carbon in any cycloalkyl may be replaced with O, S or NR<sup>9</sup> and each C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, 25 C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>8</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>10</sub> alkoxyalkyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenylalkyl is optionally substituted with 1 to 3 substituents independently selected at each 30 occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, halo, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>7</sup>, SH, -S(O)<sub>n</sub>R<sup>11</sup>, -COR<sup>6</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>6</sup>, -NR<sup>7</sup>COR<sup>6</sup>, -N(COR<sup>6</sup>)<sub>2</sub>, -NR<sup>7</sup>CONR<sup>6</sup>R<sup>7</sup>, -NR<sup>7</sup>CO<sub>2</sub>R<sup>8</sup>, 35 -NR<sup>6</sup>R<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -NHR<sup>6</sup>SO<sub>2</sub>R<sup>8</sup>, -OC(O)NR<sup>6</sup>R<sup>7</sup>, -N<sub>3</sub>, -OC(O)OR<sup>7</sup>, -CO<sub>2</sub>H, aryl, heteroaryl and heterocyclyl;



L is a linker selected from the group consisting of:  
CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup>=CR<sup>4</sup>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>, CR<sup>4</sup>=CR<sup>4</sup>,  
CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>B, CR<sup>4</sup>=CR<sup>4</sup>B;

5

R<sup>4</sup> is independently selected in each occurrence -H,  
-OR<sup>10</sup>, -COR<sup>9</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CONR<sup>9</sup>R<sup>10</sup>, -CN, -NR<sup>9</sup>R<sup>10</sup>,  
-S(O)<sub>n</sub>R<sup>12</sup>, halogen, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl,  
C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl,  
10 aryl or heteroaryl, each optionally substituted  
with the following functional groups: -OR<sup>10</sup>, -COR<sup>9</sup>,  
CO<sub>2</sub>R<sup>8</sup>,  
-CONR<sup>9</sup>R<sup>10</sup>, -CN, -NR<sup>9</sup>R<sup>10</sup>, -S(O)<sub>n</sub>R<sup>12</sup>, halogen, or two  
R<sup>4</sup> taken together form one or two carbonyl(s) or  
15 thiocarbonyl(s);

B is O, S(O)<sub>n</sub>, NR<sup>12</sup>;

A<sup>1</sup>-A<sup>4</sup> are CR<sup>5</sup>;

20

R<sup>5</sup> is independently at each occurrence -H,  
C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>1</sub>-C<sub>4</sub>  
haloalkoxy, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-  
C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, -NO<sub>2</sub>,  
25 halogen, -CN, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>COR<sup>7</sup>, -NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup>  
-OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO(NOR<sup>9</sup>)R<sup>11</sup>, -CO<sub>2</sub>R<sup>8</sup>, or  
-S(O)<sub>n</sub>R<sup>11</sup>, where C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl,  
C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl and  
C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl are optionally  
30 substituted with 1 to 3 substituents  
independently selected at each occurrence from  
C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>2</sub>-C<sub>4</sub> alkenyl, C<sub>2</sub>-C<sub>4</sub> alkynyl, C<sub>3</sub>-  
C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, C<sub>1</sub>-C<sub>4</sub>  
haloalkyl, -NO<sub>2</sub>, halogen, -CN, -NR<sup>6</sup>R<sup>7</sup>, -  
35 NR<sup>6</sup>COR<sup>7</sup>, NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup> -OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>R<sup>8</sup>,  
-CO(NOR<sup>9</sup>)R<sup>7</sup>, or -S(O)<sub>n</sub>R<sup>11</sup> and wherein two  
adjacent R<sup>5</sup> groups can form a 5-7 membered ring

- saturated or unsaturated optionally containing 1-2 O or SO<sub>n</sub> or 1-3 N heteroatoms optionally substituted with C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NO<sub>2</sub>, halogen, -CN, -NR<sup>6</sup>R<sup>7</sup>, NR<sup>6</sup>COR<sup>7</sup>, NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup>-OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CO(NOR<sup>9</sup>)R<sup>7</sup>, or -S(O)<sub>n</sub>R<sup>11</sup> and not containing any S-S, O-O, S-O or N-S bonds in the ring;
- R<sup>6</sup> and R<sup>7</sup> are independently at each occurrence H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>2</sub>-C<sub>8</sub> alkoxyalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub> alkyl)-, heteroaryl or heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl)-; or NR<sup>6</sup>R<sup>7</sup> is piperidine, pyrrolidine, piperazine, N-methylpiperazine, morpholine or thiomorpholine;
- R<sup>8</sup> is independently at each occurrence C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub> alkyl), heteroaryl or heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl);
- R<sup>9</sup> and R<sup>10</sup> are independently at each occurrence selected from H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> alkenyl, C<sub>3</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl;
- R<sup>11</sup> is C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>2</sub>-C<sub>8</sub> alkoxyalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub> alkyl), heteroaryl or heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl), piperidine, pyrrolidine, piperazine, N-methylpiperazine, morpholine or thiomorpholine;

R<sup>12</sup> is C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> alkenyl, C<sub>3</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl;

5 R<sup>13</sup> and R<sup>14</sup> are independently H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub> alkyl), heteroaryl or heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl)-, -COR<sup>12</sup>,  
10 -CO<sub>2</sub>R<sup>8</sup>, -CONR<sup>9</sup>, -S(O)<sub>n</sub>R<sup>12</sup>;

aryl is phenyl or naphthyl, each optionally substituted with 1 to 3 substituents independently selected at each occurrence from  
15 C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>10</sup>, SH, -S(O)<sub>n</sub>R<sup>12</sup>, -COR<sup>12</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>12</sup>, -NR<sup>9</sup>COR<sup>9</sup>, -N(COR<sup>12</sup>)<sub>2</sub>, -NR<sup>9</sup>CONR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>9</sup>R<sup>10</sup>,  
20 and -CONR<sup>9</sup>R<sup>10</sup>;

heteroaryl is pyridyl, pyrimidinyl, pyrazinyl, pyridazinyl, triazinyl, furanyl, quinolinyl, isoquinolinyl, thienyl, imidazolyl, thiazolyl,  
25 indolyl, pyrrolyl, oxazolyl, benzofuranyl, benzothienyl, benzthiazolyl, isoxazolyl, pyrazolyl, triazolyl, tetrazolyl, or indazolyl, each optionally substituted with 1 to 3 substituents independently selected at each occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>10</sup>, SH, -S(O)<sub>n</sub>R<sup>12</sup>, -COR<sup>12</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>12</sup>, -NR<sup>9</sup>COR<sup>9</sup>, -N(COR<sup>12</sup>)<sub>2</sub>, -NR<sup>9</sup>CONR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>CO<sub>2</sub>R<sup>8</sup>,  
30 -NR<sup>9</sup>R<sup>10</sup>, and -CONR<sup>9</sup>R<sup>10</sup>;

heterocyclyl is saturated or partially saturated  
heteroaryl, optionally substituted with 1 to 3  
substituents independently selected at each  
occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl,  
5 C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub>  
alkynyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -  
OR<sup>10</sup>, SH, -S(O)<sub>n</sub>R<sup>12</sup>, -COR<sup>12</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>12</sup>,  
-NR<sup>9</sup>COR<sup>9</sup>, -N(COR<sup>12</sup>)<sub>2</sub>, -NR<sup>9</sup>CONR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>CO<sub>2</sub>R<sup>8</sup>,  
-NR<sup>9</sup>R<sup>10</sup>, and -CONR<sup>9</sup>R<sup>10</sup>;

10

n is independently at each occurrence 0, 1 or 2;

[3] In a more preferred embodiment, the present  
invention provides a novel compound of formula I,  
15 wherein:

Q is IIa, IIb, or IIc;

20 X is N or CR<sup>1</sup>;

Y, Z are independently N or CR<sup>2</sup>;

25 U, V are >C=G, CR<sup>13</sup>R<sup>14</sup>, or NR<sup>13</sup>, O, or S without  
forming O-O, S-O, or S-S bonds;

G is O;

30 R<sup>1</sup> is independently at each occurrence H, C<sub>1</sub>-C<sub>4</sub> alkyl,  
C<sub>3</sub>-C<sub>6</sub> cycloalkyl, halogen, -CN, -NR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>COR<sup>10</sup>,  
C<sub>1</sub>-C<sub>4</sub> haloalkyl, -COR<sup>10</sup>, -OR<sup>10</sup> or -S(O)<sub>n</sub>R<sup>12</sup>;

R<sup>2</sup> is independently at each occurrence H, C<sub>1</sub>-C<sub>4</sub> alkyl,  
C<sub>3</sub>-C<sub>6</sub> cycloalkyl, halogen, -CN, -NR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>COR<sup>10</sup>,  
C<sub>1</sub>-C<sub>4</sub> haloalkyl, -COR<sup>10</sup>, -OR<sup>10</sup> or -S(O)<sub>n</sub>R<sup>12</sup>;

35

R<sup>3</sup> is C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl,  
C<sub>3</sub>-C<sub>8</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, C<sub>2</sub>-

C<sub>10</sub> alkoxyalkyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenylalkyl, where one carbon in any cycloalkyl may be replaced with O, S or NR<sup>9</sup> and each C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>8</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>10</sub> alkoxyalkyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenylalkyl is optionally substituted with 1 to 3 substituents independently selected at each occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>7</sup>, SH, -S(O)<sub>n</sub>R<sup>11</sup>, -COR<sup>6</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>6</sup>, -NR<sup>7</sup>COR<sup>6</sup>, -N(COR<sup>6</sup>)<sub>2</sub>, -NR<sup>7</sup>CONR<sup>6</sup>R<sup>7</sup>, -NR<sup>7</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>6</sup>R<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -NHR<sup>6</sup>SO<sub>2</sub>R<sup>8</sup>, -OC(O)NR<sup>6</sup>R<sup>7</sup>, -N<sub>3</sub>, -OC(O)OR<sup>7</sup>, -CO<sub>2</sub>H, aryl, heteroaryl and heterocyclyl;

L is a linker selected from the group consisting of: CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup>=CR<sup>4</sup>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>, CR<sup>4</sup>=CR<sup>4</sup>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>B, CR<sup>4</sup>=CR<sup>4</sup>B;

R<sup>4</sup> is independently selected in each occurrence -H, -OR<sup>10</sup>, -COR<sup>9</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CONR<sup>9</sup>R<sup>10</sup>, -CN, -NR<sup>9</sup>R<sup>10</sup>, -S(O)<sub>n</sub>R<sup>12</sup>, halogen, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, aryl or heteroaryl, each optionally substituted with the following functional groups: -OR<sup>10</sup>, -COR<sup>9</sup>, CO<sub>2</sub>R<sup>8</sup>, -CONR<sup>9</sup>R<sup>10</sup>, -CN, -NR<sup>9</sup>R<sup>10</sup>, -S(O)<sub>n</sub>R<sup>12</sup>, halogen, or two R<sup>4</sup> taken together form one or two carbonyl(s) or thiocarbonyl(s);

B is O, S(O)<sub>n</sub>, NR<sup>12</sup>;

A<sup>1</sup>-A<sup>4</sup> are CR<sup>5</sup>;

R<sup>5</sup> is independently at each occurrence -H, C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>1</sub>-C<sub>4</sub> haloalkoxy, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, -NO<sub>2</sub>,  
5 halogen, -CN, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>COR<sup>7</sup>, -NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup>-OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO(NOR<sup>9</sup>)R<sup>11</sup>, -CO<sub>2</sub>R<sup>8</sup>, or -S(O)<sub>n</sub>R<sup>11</sup>, where C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl and C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl are optionally  
10 substituted with 1 to 3 substituents independently selected at each occurrence from C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>2</sub>-C<sub>4</sub> alkenyl, C<sub>2</sub>-C<sub>4</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NO<sub>2</sub>, halogen, -CN, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>COR<sup>7</sup>, -NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup>-OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>R<sup>8</sup>,  
15 -CO(NOR<sup>9</sup>)R<sup>7</sup>, or -S(O)<sub>n</sub>R<sup>11</sup> and wherein two adjacent R<sup>5</sup> groups can form a 5-7 membered ring saturated or unsaturated optionally containing  
20 1-2 O or SO<sub>n</sub> or 1-3 N heteroatoms optionally substituted with C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NO<sub>2</sub>, halogen, -CN, -NR<sup>6</sup>R<sup>7</sup>, NR<sup>6</sup>COR<sup>7</sup>, NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup>,  
25 -OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CO(NOR<sup>9</sup>)R<sup>7</sup>, or -S(O)<sub>n</sub>R<sup>11</sup> and not containing any S-S, O-O, S-O or N-S bonds in the ring;

R<sup>6</sup> and R<sup>7</sup> are independently at each occurrence H, C<sub>1</sub>-C<sub>4</sub>  
30 alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>2</sub>-C<sub>8</sub> alkoxyalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub> alkyl)-, heteroaryl or heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl)-; or NR<sup>6</sup>R<sup>7</sup> is piperidine, pyrrolidine, piperazine, N-methylpiperazine, morpholine or  
35 thiomorpholine;

- $R^8$  is independently at each occurrence C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub> alkyl), heteroaryl or heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl);
- 5  $R^9$  and  $R^{10}$  are independently at each occurrence selected from H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> alkenyl, C<sub>3</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl;
- 10  $R^{11}$  is C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>2</sub>-C<sub>8</sub> alkoxyalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub> alkyl)-, heteroaryl or heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl),
- 15 piperidine, pyrrolidine, piperazine, N-methylpiperazine, morpholine or thiomorpholine;
- $R^{12}$  is C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> alkenyl, C<sub>3</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl;
- 20  $R^{13}$  and  $R^{14}$  are independently H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub> alkyl)-, heteroaryl or heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl)-, -COR<sup>12</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CONR<sup>9</sup>, -S(O)<sub>n</sub>R<sup>12</sup>;
- 25 aryl is phenyl or naphthyl, each optionally substituted with 1 to 3 substituents independently selected at each occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>10</sup>, SH,
- 30 -S(O)<sub>n</sub>R<sup>12</sup>, -COR<sup>12</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>12</sup>, -NR<sup>9</sup>COR<sup>9</sup>, -N(COR<sup>12</sup>)<sub>2</sub>, -NR<sup>9</sup>CONR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>9</sup>R<sup>10</sup>, and -CONR<sup>9</sup>R<sup>10</sup>;
- 35

heteroaryl is pyridyl, pyrimidinyl, pyrazinyl,  
pyridazinyl, triazinyl, furanyl, quinolinyl,  
isoquinolinyl, thienyl, imidazolyl, thiazolyl,  
5 indolyl, pyrrolyl, oxazolyl, benzofuranyl,  
benzothienyl, benzthiazolyl, isoxazolyl ,  
pyrazolyl, triazolyl, tetrazolyl, or indazolyl,  
each optionally substituted with 1 to 3  
substituents independently selected at each  
10 occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl,  
C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub>  
alkynyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -  
OR<sup>10</sup>, SH, -S(O)<sub>n</sub>R<sup>12</sup>, -COR<sup>12</sup>, -CO<sub>2</sub>R<sup>8</sup>, -  
OC(O)R<sup>12</sup>, -NR<sup>9</sup>COR<sup>9</sup>, -N(COR<sup>12</sup>)<sub>2</sub>, -NR<sup>9</sup>CONR<sup>9</sup>R<sup>10</sup>, -  
15 NR<sup>9</sup>CO<sub>2</sub>R<sup>8</sup>,  
-NR<sup>9</sup>R<sup>10</sup>, and -CONR<sup>9</sup>R<sup>10</sup>;

heterocyclyl is saturated or partially saturated  
heteroaryl, optionally substituted with 1 to 3  
20 substituents independently selected at each  
occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl,  
C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub>  
alkynyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -  
OR<sup>10</sup>, SH, -S(O)<sub>n</sub>R<sup>12</sup>, -COR<sup>12</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>12</sup>,  
25 -NR<sup>9</sup>COR<sup>9</sup>, -N(COR<sup>12</sup>)<sub>2</sub>, -NR<sup>9</sup>CONR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>CO<sub>2</sub>R<sup>8</sup>,  
-NR<sup>9</sup>R<sup>10</sup>, and -CONR<sup>9</sup>R<sup>10</sup>;

n is independently at each occurrence 0, 1 or 2;

30

[4] In an even more preferred embodiment, the present  
invention provides a novel compound of formula I,  
wherein: Q is Ia and X is N.

35



[5] In a still more preferred embodiment, the present invention provides a novel compound of formula I, wherein:

5 Y and Z are N or CR<sup>2</sup>;

R<sup>1</sup> is independently at each occurrence -Me, -Et, halogen, -CN, -CF<sub>3</sub>, -OMe, -SMe, -NHMe, -NMe<sub>2</sub>, -COMe, -SOMe, -SO<sub>2</sub>Me;

10

R<sup>2</sup> is -H, -Me, halogen;

15 R<sup>3</sup> is C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>8</sub> cycloalkyl or C<sub>4</sub>-C<sub>10</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>10</sub> alkoxyalkyl, cycloalkenyl, cycloalkenylalkyl, each optionally substituted with 1 to 3 substituents independently selected at each occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, halogen, 20 C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>7</sup>, -SH, -S(O)<sub>n</sub>R<sup>11</sup>, -COR<sup>6</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>10</sup>, -NR<sup>7</sup>COR<sup>6</sup>, -N(COR<sup>6</sup>)<sub>2</sub>, -NR<sup>7</sup>CONR<sup>6</sup>R<sup>7</sup>, -NR<sup>7</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>H, -CONR<sup>6</sup>R<sup>7</sup>;

25 L is CH<sub>2</sub>CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup>=CR<sup>4</sup>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>, CR<sup>4</sup>=CR<sup>4</sup>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>B, CR<sup>4</sup>=CR<sup>4</sup>B, where R<sup>4</sup> is H, or C<sub>1</sub>-C<sub>2</sub>, substituted with the following functional groups: -CF<sub>3</sub>, -OMe, -COMe, -CO<sub>2</sub>Me, -CONHMe, -CN, -NMe<sub>2</sub>, -SMe, -SOMe, -SO<sub>2</sub>Me, halogen, or two R<sup>4</sup> taken together form a carbonyl;

30

B is O, S, SO, SO<sub>2</sub>, NH, NMe;

A<sup>1</sup>-A<sup>4</sup> are CR<sup>5</sup>,

35 R<sup>5</sup> is independently at each occurrence -H, C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>1</sub>-C<sub>4</sub> haloalkoxy, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-

- C6 cycloalkyl, C4-C12 cycloalkylalkyl, -NO<sub>2</sub>, -  
 halogen, -CN, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>COR<sup>7</sup>, -NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup>  
 -OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO(NOR<sup>9</sup>)R<sup>11</sup>, -CO<sub>2</sub>R<sup>8</sup>, or  
 -S(O)<sub>n</sub>R<sup>11</sup>, where C1-C10 alkyl, C2-C10 alkenyl,  
 5 C2-C10 alkynyl, C3-C6 cycloalkyl and  
 C4-C12 cycloalkylalkyl are optionally  
 substituted with 1 to 3 substituents  
 independently selected at each occurrence from  
 C1-C4 alkyl, C2-C4 alkenyl, C2-C4 alkynyl, C3-  
 10 C6 cycloalkyl, C4-C8 cycloalkylalkyl, C1-C4  
 haloalkyl, -NO<sub>2</sub>, halogen, -CN, -NR<sup>6</sup>R<sup>7</sup>, -  
 NR<sup>6</sup>COR<sup>7</sup>, NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup> -OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>R<sup>8</sup>,  
 -CO(NOR<sup>9</sup>)R<sup>7</sup>, or -S(O)<sub>n</sub>R<sup>11</sup> and wherein two  
 adjacent R<sup>5</sup> groups can form a 5-7 membered ring  
 15 saturated on unsaturated optionally containing  
 1-2 O or SO<sub>n</sub> or 1-3 N heteroatoms optionally  
 substituted with C1-C4 alkyl, C2-C6 alkenyl,  
 C2-C6 alkynyl, C3-C6 cycloalkyl,  
 C4-C8 cycloalkylalkyl, C1-C4 haloalkyl, -NO<sub>2</sub>,  
 20 halogen, -CN, -NR<sup>6</sup>R<sup>7</sup>, NR<sup>6</sup>COR<sup>7</sup>, NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup>  
 -OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CO(NOR<sup>9</sup>)R<sup>7</sup>, or  
 -S(O)<sub>n</sub>R<sup>11</sup> and not containing any S-S, O-O, S-O  
 or N-S bonds in the ring;
- 25 R<sup>6</sup>, R<sup>7</sup>, R<sup>9</sup> and R<sup>10</sup> are independently at each  
 occurrence selected from H, C1-C4 alkyl, C1-C4  
 haloalkyl, C3-C6 alkenyl, C3-C6 alkynyl, C3-C6  
 cycloalkyl, C4-C7 cycloalkylalkyl;
- 30 R<sup>8</sup> is independently at each occurrence C1-C4 alkyl,  
 C1-C4 haloalkyl, C3-C6 cycloalkyl,  
 C4-C8 cycloalkylalkyl;
- R<sup>11</sup> is C1-C4 alkyl, C1-C4 haloalkyl, C3-C6 alkenyl,  
 35 C3-C6 alkynyl, C3-C6 cycloalkyl, C4-C7  
 cycloalkylalkyl;

[6] In a further preferred embodiment, the present invention provides a novel compound of formula I, wherein:

5

Y and Z are N;

R<sup>1</sup> is -Me or halogen;

10 

R<sup>2</sup> is -H, -Me, halogen;

R<sup>3</sup> is C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>8</sub> cycloalkyl or C<sub>4</sub>-C<sub>10</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>10</sub> alkoxyalkyl, cycloalkenyl, cycloalkenylalkyl, each  
15 optionally substituted with 1 to 3 substituents independently selected at each occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>7</sup>, -SH, -S(O)<sub>n</sub>R<sup>11</sup>,  
20 -COR<sup>6</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>10</sup>, -NR<sup>7</sup>COR<sup>6</sup>, -N(COR<sup>6</sup>)<sub>2</sub>, -NR<sup>7</sup>CONR<sup>6</sup>R<sup>7</sup>, -NR<sup>7</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>6</sup>R<sup>7</sup>, -NHR<sup>6</sup>SO<sub>2</sub>R<sup>8</sup>, -CO<sub>2</sub>H, -OC(O)NR<sup>6</sup>R<sup>7</sup>, -N<sub>3</sub>, -OC(O)OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>;

L is a linker selected from the group consisting of:  
25 CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>, CH<sub>2</sub>CH<sub>2</sub>, CH=CH, CH<sub>2</sub>CH<sub>2</sub>O;

A<sup>1</sup>, A<sup>2</sup>, A<sup>3</sup> and A<sup>4</sup> are carbon substituted independently at each occurrence with R<sup>5</sup>;

30 R<sup>5</sup> is independently at each occurrence H, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, C<sub>1</sub>-C<sub>4</sub> alkoxy, -NO<sub>2</sub>, halogen, -CN, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>COR<sup>7</sup>, -NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>11</sup> -OR<sup>7</sup>, -  
35 CONR<sup>6</sup>R<sup>7</sup>, -CO(NOR<sup>9</sup>)R<sup>11</sup>, -CO<sub>2</sub>R<sup>8</sup>, or -S(O)<sub>n</sub>R<sup>11</sup>;

R<sup>6</sup>, R<sup>7</sup>, and R<sup>9</sup> are independently at each occurrence selected from H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> alkenyl, C<sub>3</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl;

5

R<sup>8</sup>, R<sup>11</sup> are independently at each occurrence C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl;

10

[7] In another preferred embodiment, the present invention provides a novel compound of formula I, wherein the compound is selected from the group:

15 (R,S)-4-(5,7-dibromo-2,3-dihydro-1H-indol-1-yl)-1-[1-methoxyethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyrimidine;

(R,S)-4-(5,7-dichloro-2,3-dihydro-4-indol-1-yl)-1-[1-methoxyethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyrimidine;

20

4-(7-chloro-5-methylsulfonyl-2,3-dihydro-4-indol-1-yl)-1-[1-methoxyethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c] pyrimidine;

25

4-(7-chloro-5-methoxy-2,3-dihydro-4-indol-1-yl)-1-[1-methoxyethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyrimidine;

30

4-(7-chloro-5-methyl-2,3-dihydro-4-indol-1-yl)-1-[1-methoxyethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyrimidine;

35 4-(7-chloro-5-ethyl-2,3-dihydro-4-indol-1-yl)-1-[1-methoxyethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyrimidine;

4-(7-chloro-5-cyano-2,3-dihydro-4-indol-1-yl)-1-[1-methoxyethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyrimidine;

5

4-(5-acetyl-7-chloro-2,3-dihydro-4-indol-1-yl)-1-[1-methoxyethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyrimidine;

10 4-(7-chloro-5-thiomethyl-2,3-dihydro-4-indol-1-yl)-1-[1-methoxyethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c] pyrimidine; and

4-(7-chloro-5-methylsulfonyl-2,3-dihydro-4-indol-1-yl)-  
15 1-[1-methoxyethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c] pyrimidine.

[8] In another more preferred embodiment, the present  
20 invention provides a novel compound of formula I,  
wherein: Q is Ia and X is CR<sup>1</sup>.

[9] In another more preferred embodiment, the present  
25 invention provides a novel compound of formula I,  
wherein:

Y and Z are N or CR<sup>2</sup>;

30 R<sup>1</sup> is independently at each occurrence -Me, -Et,  
halogen, -CN, -CF<sub>3</sub>, -OMe, -SMe, -NHMe, -NMe<sub>2</sub>,  
-COMe, -SOMe, -SO<sub>2</sub>Me;

R<sup>2</sup> is -H, -Me, halogen;

35

R<sup>3</sup> is C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl,

C<sub>3</sub>-C<sub>8</sub> cycloalkyl or C<sub>4</sub>-C<sub>10</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>10</sub> alkoxyalkyl, cycloalkenyl, cycloalkenylalkyl, each optionally substituted with 1 to 3 substituents independently selected at each occurrence from

5 C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>7</sup>, -SH, -S(O)<sub>n</sub>R<sup>11</sup>, -COR<sup>6</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>10</sup>, -NR<sup>7</sup>COR<sup>6</sup>, -CO<sub>2</sub>H, -N(COR<sup>6</sup>)<sub>2</sub>, -NR<sup>7</sup>CONR<sup>6</sup>R<sup>7</sup>, -NR<sup>7</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>6</sup>R<sup>7</sup>,

10 -NHR<sup>6</sup>SO<sub>2</sub>R<sup>8</sup>, -OC(O)NR<sup>6</sup>R<sup>7</sup>, -N<sub>3</sub>, -OC(O)OR<sup>7</sup> and -CONR<sup>6</sup>R<sup>7</sup>;

L is a linker selected from the group consisting of: CH<sub>2</sub>CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup>=CR<sup>4</sup>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>, CR<sup>4</sup>=CR<sup>4</sup>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>B, CR<sup>4</sup>=CR<sup>4</sup>B, where R<sup>4</sup> is H, or C<sub>1</sub>-C<sub>2</sub>, substituted with the following functional groups:

15 -CF<sub>3</sub>, -OMe, -COMe, -CO<sub>2</sub>Me, -CONHMe, -CN, -NMe<sub>2</sub>, -SMe, -SOMe, -SO<sub>2</sub>Me, halogen, or two R<sup>4</sup> taken together form a carbonyl;

20 R<sup>4</sup> is independently selected in each occurrence -H, -OR<sup>10</sup>, -COR<sup>9</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CONR<sup>9</sup>R<sup>10</sup>, -CN, -NR<sup>9</sup>R<sup>10</sup>, -S(O)<sub>n</sub>R<sup>12</sup>, halogen, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, aryl or heteroaryl, each optionally substituted

25 with the following functional groups: -OR<sup>10</sup>, -COR<sup>9</sup>, CO<sub>2</sub>R<sup>8</sup>, -CONR<sup>9</sup>R<sup>10</sup>, -CN, -NR<sup>9</sup>R<sup>10</sup>, -S(O)<sub>n</sub>R<sup>12</sup>, halogen, or two R<sup>4</sup> taken together form one or two carbonyl(s) or

30 thiocarbonyl(s);

B is O, S, SO, SO<sub>2</sub>, NH, NMe;

35 A<sup>1</sup>-A<sup>4</sup> are CR<sup>5</sup>,

R<sup>5</sup> is independently at each occurrence H, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-

- C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, -NO<sub>2</sub>, halogen, -CN, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NR<sup>6</sup>R<sup>7</sup>, NR<sup>6</sup>COR<sup>7</sup>, NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>11</sup>-OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO(NOR<sup>9</sup>)R<sup>11</sup>, CO<sub>2</sub>R<sup>8</sup>, or -S(O)<sub>n</sub>R<sup>11</sup>, where C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl and C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl are optionally substituted with 1 to 3 substituents independently selected at each occurrence from C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>2</sub>-C<sub>4</sub> alkenyl, C<sub>2</sub>-C<sub>4</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NO<sub>2</sub>, halo, -CN, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>COR<sup>7</sup>, NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup>-OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, CO<sub>2</sub>R<sup>8</sup>, -CO(NOR<sup>9</sup>)R<sup>7</sup> and -S(O)<sub>n</sub>R<sup>11</sup>;
- R<sup>6</sup>, R<sup>7</sup>, R<sup>9</sup> and R<sup>10</sup> are independently at each occurrence selected from H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> alkenyl, C<sub>3</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl;
- R<sup>8</sup> is independently at each occurrence C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl;
- R<sup>11</sup> is C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> alkenyl, C<sub>3</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl.

[10] In another still more preferred embodiment, the present invention provides a novel compound of formula I, wherein:

Y and Z are N;

R<sup>1</sup> is -Me or halogen;

R<sup>2</sup> is -H, -Me, halogen;

R<sup>3</sup> is C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>8</sub> cycloalkyl or C<sub>4</sub>-C<sub>10</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>10</sub> alkoxyalkyl, cycloalkenyl, cycloalkenylalkyl, each  
5 optionally substituted with 1 to 3 substituents independently selected at each occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>7</sup>, -SH, -S(O)<sub>n</sub>R<sup>11</sup>,  
10 -COR<sup>6</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>10</sup>, -NR<sup>7</sup>COR<sup>6</sup>, -N(COR<sup>6</sup>)<sub>2</sub>, -NR<sup>7</sup>CONR<sup>6</sup>R<sup>7</sup>, -NR<sup>7</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>H, -NHR<sup>6</sup>SO<sub>2</sub>R<sup>8</sup>, -OC(O)NR<sup>6</sup>R<sup>7</sup>, -N<sub>3</sub>, -OC(O)OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>;

L is a linker selected from the group consisting of:  
15 CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>, CH<sub>2</sub>CH<sub>2</sub>, CH=CH, CH<sub>2</sub>CH<sub>2</sub>O;

A<sup>1</sup>, A<sup>2</sup>, A<sup>3</sup> and A<sup>4</sup> are carbon substituted independently at each occurrence with R<sup>5</sup>;

20 R<sup>5</sup> is independently at each occurrence H, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, C<sub>1</sub>-C<sub>4</sub> alkoxy, -NO<sub>2</sub>, halogen, -CN, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>COR<sup>7</sup>, -NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>11</sup> -OR<sup>7</sup>, -  
25 CONR<sup>6</sup>R<sup>7</sup>, -CO(NOR<sup>9</sup>)R<sup>11</sup>, -CO<sub>2</sub>R<sup>8</sup>, or -S(O)<sub>n</sub>R<sup>11</sup>;

R<sup>6</sup>, R<sup>7</sup>, and R<sup>9</sup> are independently at each occurrence selected from H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl,  
30 C<sub>3</sub>-C<sub>6</sub> alkenyl, C<sub>3</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl;

R<sup>8</sup>, R<sup>11</sup> are independently at each occurrence C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-  
35 C<sub>8</sub> cycloalkylalkyl;



[11] In another preferred embodiment, the present invention provides a novel compound of formula I, wherein the compound is selected from the group:

- 5 (S)-4-(5,7-dibromo-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- (R,S)-4-(5,7-dibromo-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- 10 (R,S)-4-(5,7-dibromo-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- 15 4-(5,7-dimethoxy-2,3-dihydro-1H-indol-1-yl)-1-[1-ethylpropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- 20 (R,S)-4-(5-bromo-7-methoxy-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- (R,S)-4-(5-bromo-7-methoxy-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- 25 (R,S)-4-(5-bromo-7-methyl-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- 30 (R,S)-4-(5-bromo-7-chloro-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- 35

- (R,S)-4-(5-bromo-7-chloro-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- 5 (R,S)-4-(7-chloro-5-methoxy-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- 10 (S)-4-(7-chloro-5-methoxy-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- 15 (R,S)-4-(7-chloro-5-methyl-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- 20 (R,S)-4-(7-chloro-5-ethyl-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- 25 (R,S)-4-(7-chloro-5-cyano-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- 30 (R,S)-4-(7-chloro-5-thiomethyl-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- 35 (R,S)-4-(7-chloro-5-methoxy-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- (R,S)-4-(7-chloro-5-methyl-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

(R,S)-4-(7-chloro-5-ethyl-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

5 (R,S)-4-(7-chloro-5-cyano-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

4-(7-chloro-5-thiomethyl-2,3-dihydro-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

10

4-(7-chloro-5-methylsulfonyl-2,3-dihydro-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

15

4-(7-chloro-5-methoxy-2,3-dihydro-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

20 4-(7-chloro-5-methyl-2,3-dihydro-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

4-(7-chloro-5-ethyl-2,3-dihydro-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

25

4-(7-chloro-5-cyano-2,3-dihydro-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

4-(5-acetyl-7-chloro-2,3-dihydro-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

30

4-(7-chloro-5-methylsulfonyl-2,3-dihydro-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

35

4-(5,7-dichloro-2,3-dihydro-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

- (R,S)-4-(5,7-dichloro-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- 5 (R,S)-4-(5,7-dichloro-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- 10 4-(5,7-dichloro-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxyethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- (R,S)-4-(5,7-dichloro-2,3-dihydro-1H-indol-1-yl)-1-[1-(cyanomethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- 15 (R,S)-4-(5,7-dichloro-2,3-dihydro-1H-indol-1-yl)-1-[1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- 20 N-(7-chloro-5-methoxy-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- N-(7-chloro-5-methyl-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- N-(7-chloro-5-ethyl-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- 25 N-(7-chloro-5-cyano-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- N-(5-acetyl-7-chloro-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- 30 N-(7-chloro-5-thiomethyl-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- 35 N-(7-chloro-5-methylsulfonyl-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

- (R,S)-8-chloro-1,2,3,4-tetrahydro-1-[1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline;
- 5 (R,S)-8-bromo-1,2,3,4-tetrahydro-1-[1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline;
- 10 (R,S)-8-chloro-6-methoxy-1,2,3,4-tetrahydro-1-[1-[1-(methoxymethyl)propyl]-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline;
- 15 (R,S)-8-chloro-6-cyano-1,2,3,4-tetrahydro-1-[1-[1-(methoxymethyl)propyl]-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline;
- 20 (R,S)-8-chloro-1,2,3,4-tetrahydro-1-[1-[1-(methoxymethyl)propyl]-6-methylsulfonyl-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline;
- 25 8-chloro-1,2,3,4-tetrahydro-1-[1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline;
- 30 8-bromo-1,2,3,4-tetrahydro-1-[1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline;
- 35 8-chloro-1,2,3,4-tetrahydro-1-[1-(1-ethylpropyl)-6-methoxy-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline;
- 8-chloro-6-cyano-1,2,3,4-tetrahydro-1-[1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline;

8-chloro-1,2,3,4-tetrahydro-1-[1-(1-ethylpropyl)-6-methylsulfonyl-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline;

- 5 6-acetyl-8-chloro-1,2,3,4-tetrahydro-1-[1-(1-ethylpropyl)-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline; and

- (R,S)-5-bromo-3,4-dihydro-4-[1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-7-methyl-2H-1,4-benzoxazine.
- 10

The present invention also provides pharmaceutical compositions comprising a pharmaceutically acceptable carrier and a therapeutically effective amount of a compounds of Formula (I) as described above.

15

The present invention further comprises a method of treating affective disorder, anxiety, depression, headache, irritable bowel syndrome, post-traumatic stress disorder, supranuclear palsy, immune suppression, Alzheimer's disease, gastrointestinal diseases, anorexia nervosa or other feeding disorder, drug addiction, drug or alcohol withdrawal symptoms, inflammatory diseases, cardiovascular or heart-related diseases, fertility problems, human immunodeficiency virus infections, hemorrhagic stress, obesity, infertility, head and spinal cord traumas, epilepsy, stroke, ulcers, amyotrophic lateral sclerosis, hypoglycemia or a disorder the treatment of which can be effected or facilitated by antagonizing CRF, including but not limited to disorders induced or facilitated by CRF, in mammals comprising administering to the mammal a therapeutically effective amount of a compound of Formula (I) as described above.

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The compounds herein described may have asymmetric centers. Compounds of the present invention containing an asymmetrically substituted atom may be isolated in optically active or racemic forms. It is well known in the art how to prepare optically active forms, such as by resolution of racemic forms or by synthesis from optically active starting materials. Many geometric isomers of olefins, C=N double bonds, and the like can also be present in the compounds described herein, and all such stable isomers are contemplated in the present invention. Cis and trans geometric isomers of the compounds of the present invention are described and may be isolated as a mixture of isomers or as separated isomeric forms. All chiral, diastereomeric, racemic forms and all geometric isomeric forms of a structure are intended, unless the specific stereochemistry or isomeric form is specifically indicated. All processes used to prepare compounds of the present invention and intermediates made therein are considered to be part of the present invention.

The term "substituted," as used herein, means that any one or more hydrogens on the designated atom is replaced with a selection from the indicated group, provided that the designated atom's normal valency is not exceeded, and that the substitution results in a stable compound. When a substituent is keto (i.e., =O), then 2 hydrogens on the atom are replaced. Keto substituents are not present on aromatic moieties.

The present invention is intended to include all isotopes of atoms occurring in the present compounds. Isotopes include those atoms having the same atomic number but different mass numbers. By way of general example and without limitation, isotopes of hydrogen include tritium and deuterium. Isotopes of carbon include C-13 and C-14.

When any variable (e.g., R<sup>6</sup>) occurs more than one time in any constituent or formula for a compound, its

definition at each occurrence is independent of its definition at every other occurrence. Thus, for example, if a group is shown to be substituted with 0-2  $R^6$ , then said group may optionally be substituted with up to two  $R^6$  groups and  $R^6$  at each occurrence is selected independently from the definition of  $R^6$ . Also, combinations of substituents and/or variables are permissible only if such combinations result in stable compounds.

10        When a bond to a substituent is shown to cross a bond connecting two atoms in a ring, then such substituent may be bonded to any atom on the ring. When a substituent is listed without indicating the atom via which such substituent is bonded to the rest  
15 of the compound of a given formula, then such substituent may be bonded via any atom in such substituent. Combinations of substituents and/or variables are permissible only if such combinations result in stable compounds.

20        As used herein, "alkyl" is intended to include both branched and straight-chain saturated aliphatic hydrocarbon groups having the specified number of carbon atoms. Examples of alkyl include, but are not limited to, methyl, ethyl, n-propyl, i-propyl, n-butyl, s-butyl, t-butyl, n-pentyl, and s-pentyl. "Haloalkyl"  
25 is intended to include both branched and straight-chain saturated aliphatic hydrocarbon groups having the specified number of carbon atoms, substituted with 1 or more halogen (for example  $-C_vF_w$  where  $v = 1$  to  $3$  and  $w = 1$  to  $(2v+1)$ ). Examples of haloalkyl include, but are  
30 not limited to, trifluoromethyl, trichloromethyl, pentafluoroethyl, and pentachloroethyl. "Alkoxy" represents an alkyl group as defined above with the indicated number of carbon atoms attached through an  
35 oxygen bridge. Examples of alkoxy include, but are not limited to, methoxy, ethoxy, n-propoxy, i-propoxy, n-butoxy, s-butoxy, t-butoxy, n-pentoxy, and s-pentoxy.



"Cycloalkyl" is intended to include saturated ring groups, such as cyclopropyl, cyclobutyl, or cyclopentyl. "Alkenyl" is intended to include hydrocarbon chains of either a straight or branched configuration and one or more unsaturated carbon-carbon bonds which may occur in any stable point along the chain, such as ethenyl and propenyl. "Alkynyl" is intended to include hydrocarbon chains of either a straight or branched configuration and one or more triple carbon-carbon bonds which may occur in any stable point along the chain, such as ethynyl and propynyl.

"Halo" or "halogen" as used herein refers to fluoro, chloro, bromo, and iodo; and "counterion" is used to represent a small, negatively charged species such as chloride, bromide, hydroxide, acetate, and sulfate.

As used herein, "carbocycle" or "carbocyclic residue" is intended to mean any stable 3- to 7-membered monocyclic or bicyclic or 7-to 13-membered bicyclic or tricyclic, any of which may be saturated, partially unsaturated, or aromatic. Examples of such carbocycles include, but are not limited to, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, adamantyl, cyclooctyl, [3.3.0]bicyclooctane, [4.3.0]bicyclononane, [4.4.0]bicyclodecane, [2.2.2]bicyclooctane, fluorenyl, phenyl, naphthyl, indanyl, adamantyl, and tetrahydronaphthyl.

As used herein, the term "heterocycle" or "heterocyclic system" is intended to mean a stable 5-to 7-membered monocyclic or bicyclic or 7-to 10-membered bicyclic heterocyclic ring which is saturated partially unsaturated or unsaturated (aromatic), and which consists of carbon atoms and from 1 to 4 heteroatoms independently selected from the group consisting of N, O and S and including any bicyclic group in which any

of the above-defined heterocyclic rings is fused to a benzene ring. The nitrogen and sulfur heteroatoms may optionally be oxidized. The heterocyclic ring may be attached to its pendant group at any heteroatom or carbon atom which results in a stable structure. The heterocyclic rings described herein may be substituted on carbon or on a nitrogen atom if the resulting compound is stable. A nitrogen in the heterocycle may optionally be quaternized. It is preferred that when the total number of S and O atoms in the heterocycle exceeds 1, then these heteroatoms are not adjacent to one another. It is preferred that the total number of S and O atoms in the heterocycle is not more than 1. As used herein, the term "aromatic heterocyclic system" is intended to mean a stable 5-to 7-membered monocyclic or bicyclic or 7-to 10-membered bicyclic heterocyclic aromatic ring which consists of carbon atoms and from 1 to 4 heteroatoms independently selected from the group consisting of N, O and S. It is preferred that the total number of S and O atoms in the aromatic heterocycle is not more than 1.

Examples of heterocycles include, but are not limited to, acridinyl, azocinyl, benzimidazolyl, benzofuranyl, benzothiofuranyl, benzothiophenyl, benzoxazolyl, benzthiazolyl, benztriazolyl, benztetrazolyl, benzisoxazolyl, benzisothiazolyl, benzimidazoliny, carbazolyl, 4aH-carbazolyl, carbolinyl, chromanyl, chromenyl, cinnolinyl, decahydroquinolinyl, 2H,6H-1,5,2-dithiazinyl, dihydrofuro[2,3-b]tetrahydrofuran, furanyl, furazanyl, imidazolidinyl, imidazoliny, imidazolyl, 1H-indazolyl, indolenyl, indolinyl, indoliziny, indolyl, 3H-indolyl, isobenzofuranyl, isochromanyl, isoindazolyl, isoindolinyl, isoindolyl, isoquinolinyl, isothiazolyl, isoxazolyl, methylenedioxyphenyl, morpholinyl, naphthyridinyl, octahydroisoquinolinyl, oxadiazolyl, 1,2,3-oxadiazolyl, 1,2,4-oxadiazolyl, 1,2,5-

oxadiazolyl, 1,3,4-oxadiazolyl, oxazolidinyl, oxazolyl,  
oxazolidinyl, pyrimidinyl, phenanthridinyl,  
phenanthrolinyl, phenazinyl, phenothiazinyl,  
phenoxathiinyl, phenoxazinyl, phthalazinyl,  
5 piperazinyl, piperidinyl, pteridinyl, purinyl, pyranyl,  
pyrazinyl, pyrazolidinyl, pyrazolinyl, pyrazolyl,  
pyridazinyl, pyridooxazole, pyridoimidazole,  
pyridothiazole, pyridinyl, pyridyl, pyrimidinyl,  
pyrrolidinyl, pyrrolinyl, 2H-pyrrolyl, pyrrolyl,  
10 quinazolinyl, quinolinyl, 4H-quinoliziny,   
quinoxalinyl, quinuclidinyl, tetrahydrofuranyl,  
tetrahydroisoquinolinyl, tetrahydroquinolinyl, 6H-  
1,2,5-thiadiazinyl, 1,2,3-thiadiazolyl, 1,2,4-  
thiadiazolyl, 1,2,5-thiadiazolyl, 1,3,4-thiadiazolyl,  
15 thianthrenyl, thiazolyl, thienyl, thienothiazolyl,  
thienooxazolyl, thienoimidazolyl, thiophenyl,  
triazinyl, 1,2,3-triazolyl, 1,2,4-triazolyl, 1,2,5-  
triazolyl, 1,3,4-triazolyl, and xanthenyl. Preferred  
heterocycles include, but are not limited to,  
20 pyridinyl, furanyl, thienyl, pyrrolyl, pyrazolyl,  
pyrrolidinyl, imidazolyl, indolyl, benzimidazolyl, 1H-  
indazolyl, oxazolidinyl, benzotriazolyl,  
benzisoxazolyl, oxindolyl, benzoxazolinyl, and  
isatinoyl. Also included are fused ring and spiro  
25 compounds containing, for example, the above  
heterocycles.

The term "amino acid" as used herein means an  
organic compound containing both a basic amino group  
and an acidic carboxyl group. Included within this  
30 term are natural amino acids (e.g., L-amino acids),  
modified and unusual amino acids (e.g., D-amino  
acids), as well as amino acids which are known to  
occur biologically in free or combined form but  
usually do not occur in proteins. Included within  
35 this term are modified and unusual amino acids, such  
as those disclosed in, for example, Roberts and  
Vellaccio (1983) The Peptides, 5: 342-429, the

teaching of which is hereby incorporated by reference. Natural protein occurring amino acids include, but are not limited to, alanine, arginine, asparagine, aspartic acid, cysteine, glutamic acid, glutamine, glycine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, serine, threonine, tyrosine, tryptophan, proline, and valine. Natural non-protein amino acids include, but are not limited to arginosuccinic acid, citrulline, cysteine sulfinic acid, 3,4-dihydroxyphenylalanine, homocysteine, homoserine, ornithine, 3-moniodotyrosine, 3,5-diiodotyrosine, 3,5,5'-triiodothyronine, and 3,3',5,5'-tetraiodothyronine. Modified or unusual amino acids which can be used to practice the invention include, but are not limited to, D-amino acids, hydroxylysine, 4-hydroxyproline, an N-Cbz-protected amino acid, 2,4-diaminobutyric acid, homoarginine, norleucine, N-methylaminobutyric acid, naphthylalanine, phenylglycine,  $\beta$ -phenylproline, tert-leucine, 4-aminocyclohexylalanine, N-methyl-norleucine, 3,4-dehydroproline, N,N-dimethylaminoglycine, N-methylaminoglycine, 4-aminopiperidine-4-carboxylic acid, 6-aminocaproic acid, trans-4-(aminomethyl)-cyclohexanecarboxylic acid, 2-, 3-, and 4-(aminomethyl)-benzoic acid, 1-aminocyclopentanecarboxylic acid, 1-aminocyclopropanecarboxylic acid, and 2-benzyl-5-aminopentanoic acid. The term "amino acid residue" as used herein means that portion of an amino acid (as defined herein) that is present in a peptide.

The phrase "pharmaceutically acceptable" is employed herein to refer to those compounds, materials, compositions, and/or dosage forms which are, within the scope of sound medical judgment, suitable for use in

contact with the tissues of human beings and animals without excessive toxicity, irritation, allergic response, or other problem or complication, commensurate with a reasonable benefit/risk ratio.

5       As used herein, "pharmaceutically acceptable salts" refer to derivatives of the disclosed compounds wherein the parent compound is modified by making acid or base salts thereof. Examples of pharmaceutically acceptable salts include, but are not limited to,  
10 mineral or organic acid salts of basic residues such as amines; and alkali or organic salts of acidic residues such as carboxylic acids. The pharmaceutically acceptable salts include the conventional non-toxic salts or the quaternary ammonium salts of the parent  
15 compound formed, for example, from non-toxic inorganic or organic acids. For example, such conventional non-toxic salts include those derived from inorganic acids such as hydrochloric, hydrobromic, sulfuric, sulfamic, phosphoric, and nitric; and the salts prepared from  
20 organic acids such as acetic, propionic, succinic, glycolic, stearic, lactic, malic, tartaric, citric, ascorbic, pamoic, maleic, hydroxymaleic, phenylacetic, glutamic, benzoic, salicylic, sulfanilic, 2-acetoxybenzoic, fumaric, toluenesulfonic,  
25 methanesulfonic, ethane disulfonic, oxalic, and isethionic.

The pharmaceutically acceptable salts of the present invention can be synthesized from the parent compound which contains a basic or acidic moiety by  
30 conventional chemical methods. Generally, such salts can be prepared by reacting the free acid or base forms of these compounds with a stoichiometric amount of the appropriate base or acid in water or in an organic solvent, or in a mixture of the two; generally,  
35 nonaqueous media like ether, ethyl acetate, ethanol, isopropanol, or acetonitrile are preferred. Lists of suitable salts are found in *Remington's Pharmaceutical*

Sciences, 17th ed., Mack Publishing Company, Easton, PA, 1985, p. 1418, the disclosure of which is hereby incorporated by reference.

Since prodrugs are known to enhance numerous  
5 desirable qualities of pharmaceuticals (e.g.,  
solubility, bioavailability, manufacturing, etc...) the  
compounds of the present invention may be delivered in  
prodrug form. Thus, the present invention is intended  
to cover prodrugs of the presently claimed compounds,  
10 methods of delivering the same and compositions  
containing the same. "Prodrugs" are intended to  
include any covalently bonded carriers which release an  
active parent drug of the present invention *in vivo*  
when such prodrug is administered to a mammalian  
15 subject. Prodrugs the present invention are prepared  
by modifying functional groups present in the compound  
in such a way that the modifications are cleaved,  
either in routine manipulation or *in vivo*, to the  
parent compound. Prodrugs include compounds of the  
20 present invention wherein a hydroxy, amino, or  
sulfhydryl group is bonded to any group that, when the  
prodrug of the present invention is administered to a  
mammalian subject, it cleaves to form a free hydroxyl,  
free amino, or free sulfhydryl group, respectively.  
25 Examples of prodrugs include, but are not limited to,  
acetate, formate and benzoate derivatives of alcohol  
and amine functional groups in the compounds of the  
present invention.

"Stable compound" and "stable structure" are meant  
30 to indicate a compound that is sufficiently robust to  
survive isolation to a useful degree of purity from a  
reaction mixture, and formulation into an efficacious  
therapeutic agent.

"Substituted" is intended to indicate that one or  
35 more hydrogens on the atom indicated in the expression  
using "substituted" is replaced with a selection from  
the indicated group(s), provided that the indicated

atom's normal valency is not exceeded, and that the substitution results in a stable compound. When a substituent is keto (i.e., =O) group, then 2 hydrogens on the atom are replaced.

5 "Therapeutically effective amount" is intended to include an amount of a compound of the present invention or an amount of the combination of compounds claimed effective to inhibit HIV infection or treat the symptoms of HIV infection in a host. The combination  
10 of compounds is preferably a synergistic combination. Synergy, as described for example by Chou and Talalay, Adv. Enzyme Regul. 22:27-55 (1984), occurs when the effect (in this case, inhibition of HIV replication) of the compounds when administered in combination is  
15 greater than the additive effect of the compounds when administered alone as a single agent. In general, a synergistic effect is most clearly demonstrated at suboptimal concentrations of the compounds. Synergy can be in terms of lower cytotoxicity, increased  
20 antiviral effect, or some other beneficial effect of the combination compared with the individual components.

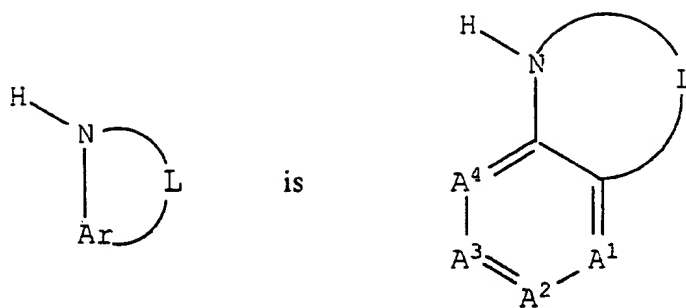
The term "therapeutically effective amount" of a compound of this invention means an amount effective to  
25 antagonize abnormal level of CRF or treat the symptoms of affective disorder, anxiety or depression in a host.

### Synthesis

30

The bicyclic fused pyrimidine and pyridines of this invention can be prepared by one of the general schemes outlined below (Schemes 1-15).

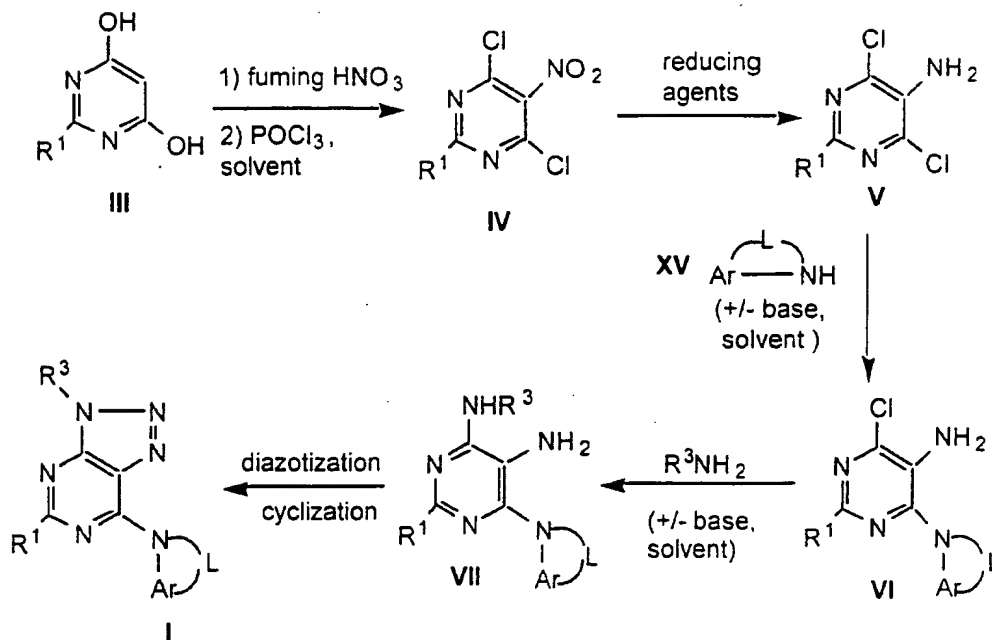
Compounds of the Formula (I) wherein X and Y  
35 are N and Z is NR<sup>3</sup>, and



can be prepared as shown in Scheme 1.

5

### Scheme 1



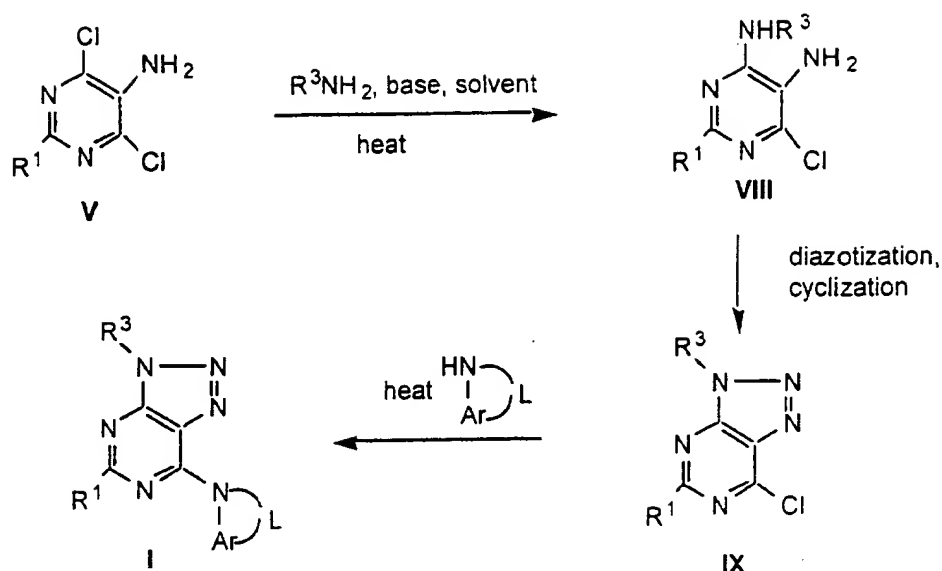
wherein  $X=Y=N$ ;  $Z=NR^3$

The 4,6-dihydroxypyrimidines (III) can be nitrated using fuming nitric acid and then converted into intermediates (IV) by the action of phosphorous oxychloride with the optional assistance of a catalyst such as dialkylanilines (see: Brown, D.J. et.al. J. Chem. Soc., 1954, 3832). The amino group of pyrimidines of Formula (V) can be prepared from the corresponding nitro compounds (IV) by treatment with reducing agents such as, but not limited to,



sodium dithionate, iron or zinc, or catalytic hydrogenation (see: Larock, R.C. *Comprehensive Organic Transformations*, VCH Publishers, New York, 1989, 411). Reaction with compounds of Formula -Ar-L-NH- (XV), can be used to provide compounds of Formula (VI). Conditions which may facilitate this transformation include the optional presence of protic or aprotic acids, or bases such as alkali metal hydrides, trialkylamines, or alkali metal carbonates, or alkali metal bis(trimethylsilyl)amides wherein the metal can be sodium, lithium, or potassium. These reactions may be conducted neat, or in the optional presence of solvents such as but not limited to cyclic ethers such as tetrahydrofuran, dialkylformamides, ethylene glycol, 2-ethoxyethanol, halocarbons, alkanenitriles, or alkyl alcohols at room temperature or at elevated temperature up to the boiling point of the solvent employed. One skilled in the art of organic synthesis will readily understand the optimal combinations of these conversions to prepare a number of compounds of Formula (VI). Treatment of compound of Formula (VI) with primary amines then can provide the intermediates (VII) using reaction conditions similar to those employed for the conversion of (V) to (VI). Cyclization to triazolopyrimidines of Formula (I) can then be readily accomplished by diazotization and cyclization of the diamino compounds of Formula (VII) with an alkali metal nitrite in the presence of acid in water with or without an organic cosolvent such as halocarbons, or cyclic ethers. Alternatively, compounds of Formula (I) wherein X and Y are N and Z is NR<sup>3</sup>, of this invention can be prepared as outlined in Scheme 2:

## Scheme 2

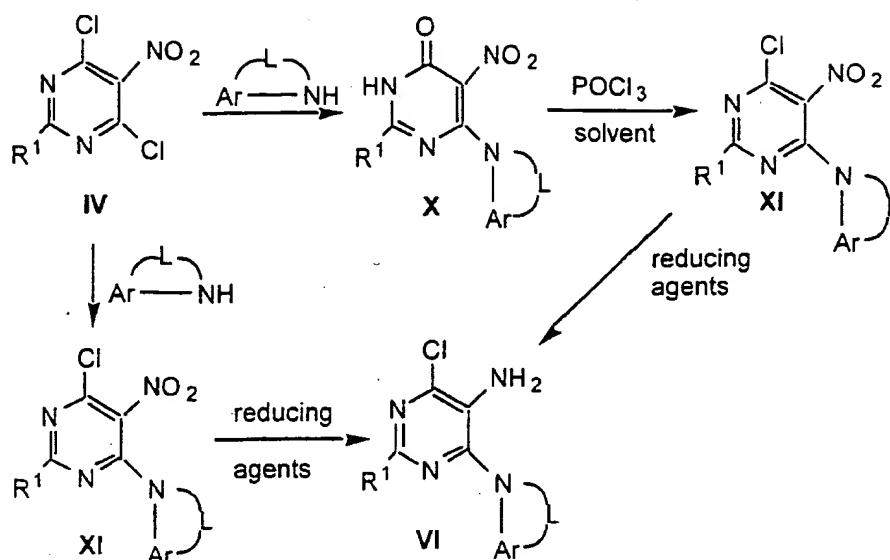


wherein  $X=Y=N$ ,  $Z=\text{NR}^3$

Treatment of compound of Formula (V) with primary  
 5 amines can provide the diamino substituted  
 pyrimidines (VIII). Conditions which facilitate  
 this transformation are detailed previously for the  
 conversion of (VI) to (VII). Cyclization to  
 triazolopyrimidines of Formula (VIII) can then be  
 10 readily accomplished by following the conditions  
 already described for the conversion of (VII) to (I)  
 in Scheme 1. The leaving group such as, but not  
 limited to, halogen can then be displaced by  
 addition of  $-\text{Ar}-\text{L}-\text{NH}-$  to provide compounds of  
 15 Formula (I) by utilizing the conditions described  
 for the conversion of (V) to (VI).

Compounds of the Formula (VI) can also prepared  
 by an another approach (Scheme 3) involving addition  
 of  $-\text{Ar}-\text{L}-\text{NH}-$  to (IV) to afford compounds of Formula  
 20 (XI).

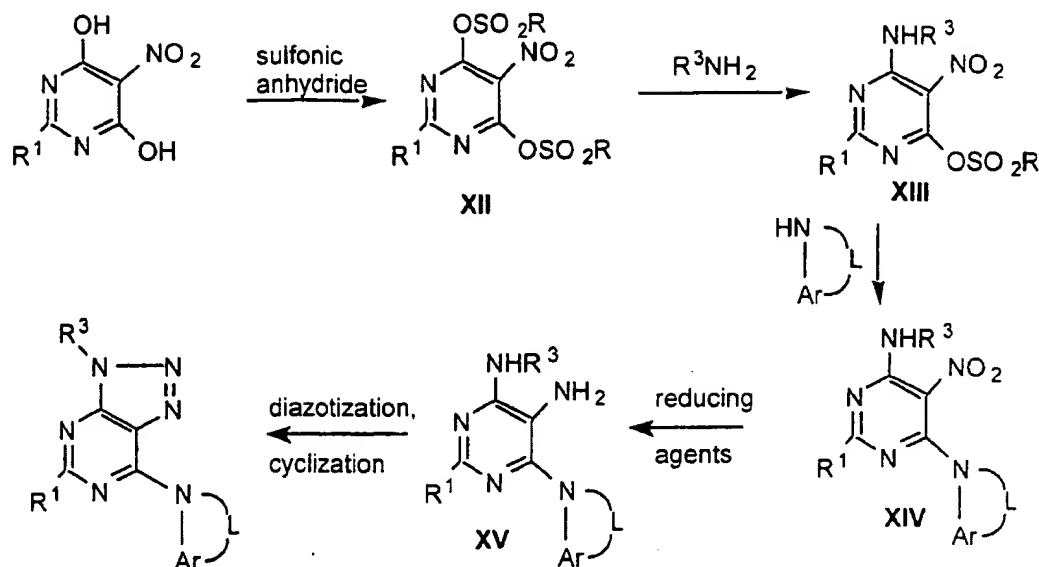
## Scheme 3



- The nitro group in (XI) can be reduced to give compounds of Formula (VI) under conditions similar to those described for the transformation of (IV) to (V) in Scheme 1. Alternatively, as shown in Scheme 3, addition of -Ar-L-NH- to compounds of Formula (IV) can generate in-situ the pyrimidones (X). For example, treatment of dichloropyrimidines of Formula (IV) with one equivalent of -Ar-L-NH- in the presence of solvents such as (but not limited to) dialkylsulfoxides, dialkylformamides, and alkyl alcohols readily generate pyrimidones (X). Compounds of Formula (X) can be converted into (XI) by the action of phosphorous oxychloride with the optional assistance of a catalyst such as dialkylanilines with or without an inert solvent. Compounds of Formula (XI) can be reduced to give (IV) under conditions described in Scheme 1. Compounds of Formula (VI) are elaborated to structures of Formula (I) as previously shown in Scheme 1.

Scheme 4 outlines another route to fused triazolopyrimidine type of compounds of this invention.

## Scheme 4

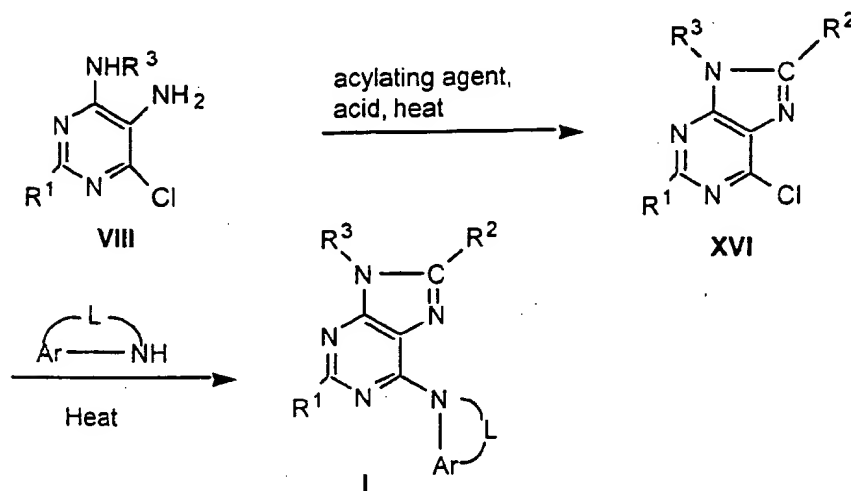


wherein  $X=Y=N$ ;  $Z=NR^3$

- 4,6-dihydroxy-5-nitropyrimidines can be treated with aryl sulfonic anhydrides, aryl sulfonyl chlorides, alkyl sulfonic anhydrides or alkyl sulfonyl chlorides in the presence or absence of bases such as alkali metal hydrides, alkaline earth metal hydrides, alkali metal dialkyl amides in inert solvents such as dialkylformamides, dialkylacetamides at temperatures ranging from 0 ° to 200 °C to give intermediates of Formula (XII). Compounds of Formula (XII) are treated with primary amines to give aminonitropyrimidines (XIII). Treatment of (XIII) with -Ar-L-NH- can provide compounds of Formula (XIV). Compounds of the formula (XIV) can be reduced to amino derivatives (VII) using the reagents described for the conversion of (IV) to (V) in Scheme 1. Intermediate (VII) can be converted to (I) (X and Y are N; Z is  $NR^3$ ) by diazotization and cyclization as delineated in Scheme 1.

Fused imidazolopyrimidines of the Formula (I) wherein X is N, Y is CR<sup>2</sup>, and Z is NR<sup>3</sup>, can be prepared from compound (VIII) as shown in Scheme 5.

Scheme 5



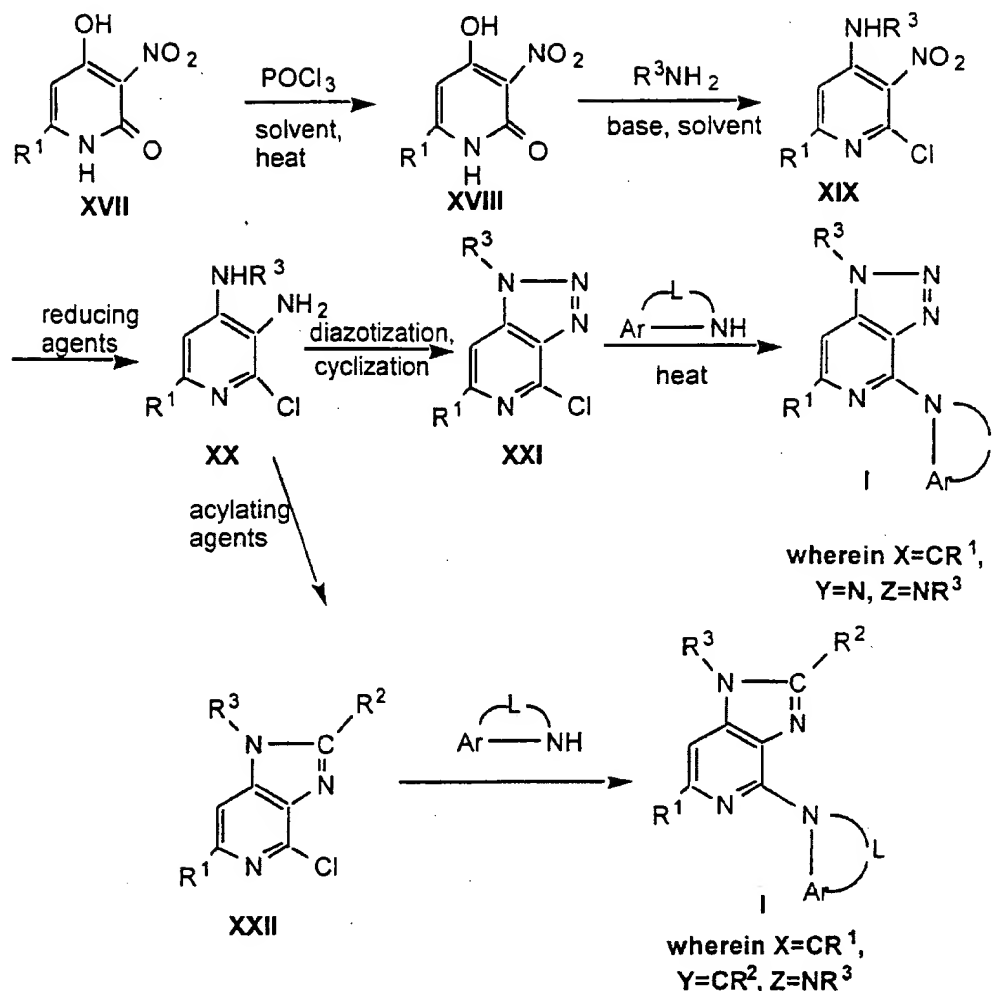
wherein X=N, Y=CR<sup>2</sup>, Z=NR<sup>3</sup>

5 Treatment of (VIII) with an acylating agent such as, but not limited to, alkyl anhydrides, haloalkyl anhydrides, alkylamides, haloalkyl amides, trialkylorthoesters R<sup>2</sup>(OR)<sub>3</sub> (where R is C<sub>1</sub>-C<sub>4</sub> alkyl), iminoesters, guanidines, cyanogen bromide, R<sup>2</sup>COOH, urea or thiourea in the presence or absence of an acid (such as HOAc, HCl, H<sub>2</sub>SO<sub>4</sub>) in the presence or absence of an organic cosolvent such as alkyl alcohols, cyclic ethers, or aromatic solvents at temperatures ranging from 0 ° to 200 °C gives compounds of Formula (XVI). Treatment of (XVI) with -Ar-L-NH- can provide imidazolopyrimidine (I, wherein X is N, Y is CR<sup>2</sup>, Z is NR<sup>3</sup>).

20

The method of synthesis of the triazolopyrimidines of this invention is shown in Scheme 6.

## Scheme 6



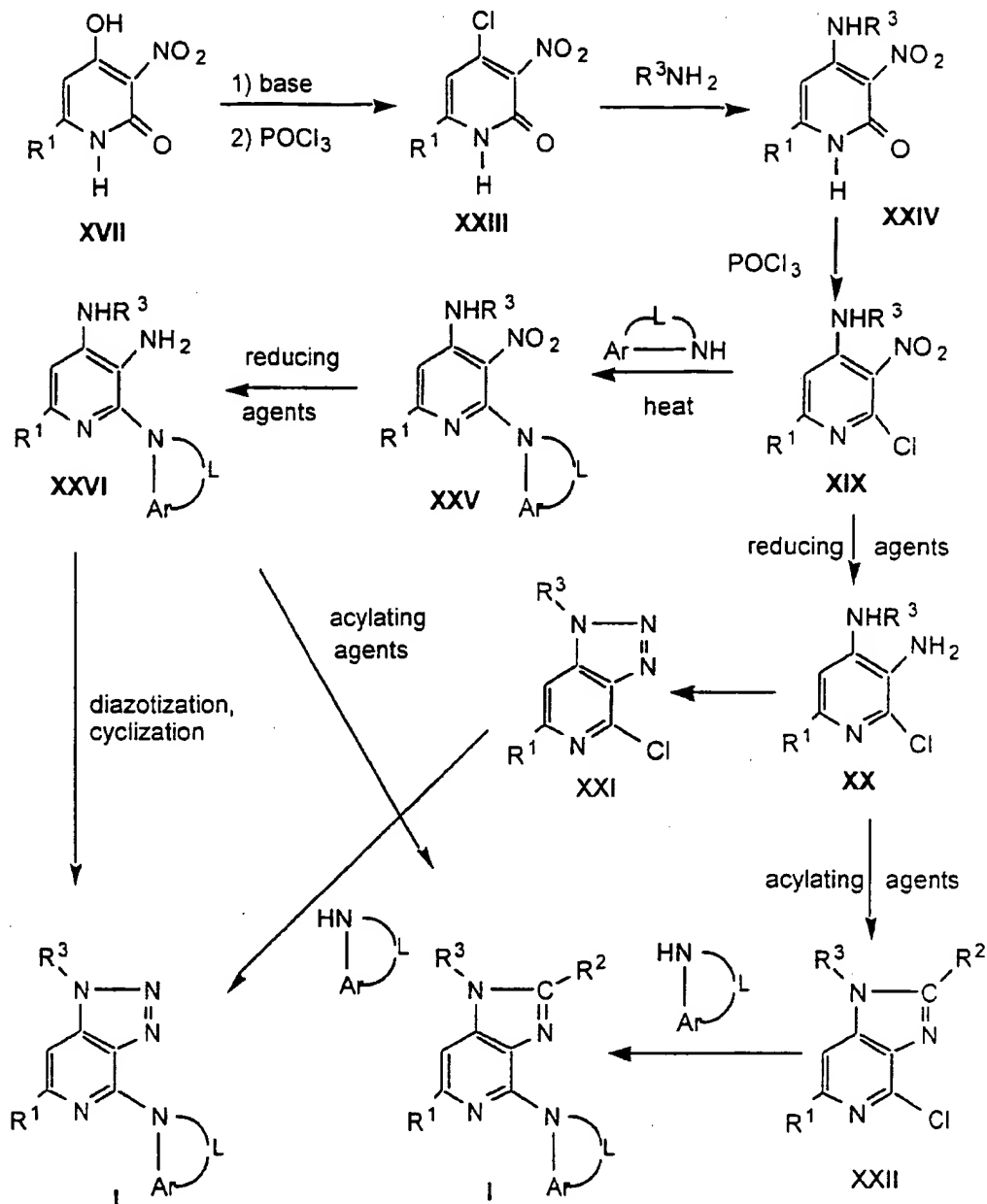
- The 4-hydroxy group in (XVII) can be converted into chloro by the action of phosphorous oxychloride with the optional assistance of a catalyst such as dialkylaniline (see: Brown, D.J. et.al. J. Chem. Soc., 1954, 3832) to afford compounds of Formula (XVIII). Addition of primary amines to compound (XVIII) can provide alkylaminonitropyridines (XIX).
- 10 The nitro group in (XIX) can be reduced using the conditions employed for the transformation of (IV) to (V) in Scheme 1 to give (XX). Diazotization and cyclization of (XX) can provide chlorotriazolopyridine derivatives (XXI) as was
- 15 described for the conversion of (VI) to (VII) in

Scheme 1. The chloro group can then be displaced by addition of -Ar-L-NH- to afford compounds of Formula (I).

5           Imidazolopyridines of the present invention can be prepared from compound (XX) as shown in Scheme 6 by following the conditions outlined for the conversion of (VIII) to (XVI) in Scheme 5. Treatment of compound (XXII) with -Ar-L-NH- using  
10 the conditions outlined in Scheme 1 can provide compounds of Formula I.

          Alternatively, the triazolopyridines and imidazolopyridines can be synthesized as shown in  
15 Scheme 7. Treatment of compounds of Formula (XVII) with an aliphatic or aromatic amine in the appropriate organic solvent but not limited to, alkyl alcohols such as methanol, ethanol, propanol, butanol, alkyl alkanoates such as ethyl acetate,  
20 alkanenitriles such as acetonitrile, dialkyl formamides such as DMF gives the corresponding ammonium salt, which upon treatment with POCl<sub>3</sub> at temperatures from 25 to 120 °C, give compounds of Formula (XXIII). Treatment of compounds of Formula  
25 (XXIII) with appropriate primary amines in an organic solvent such as but not limited to, alkyl alcohols such as methanol, ethanol, propanol, butanol, alkyl alkanoates such as ethyl acetate, alkanenitriles such as acetonitrile, dialkyl  
30 formamides such as DMF, dialkylsulfoxides at temperatures from 25 to 120 °C to give (XXIV). This was converted to (XIX) by treatment with POCl<sub>3</sub> at temperatures from 25 to 120 °C.

## Scheme 7



wherein  $\text{X}=\text{CR}^1$ ,  $\text{Y}=\text{N}$ ,  $\text{Z}=\text{NR}^3$  wherein  $\text{X}=\text{CR}^1$ ,  $\text{Y}=\text{CR}^2$ ,  $\text{Z}=\text{NR}^3$

Compounds of Formula (XIX) could be coupled with -  
 Ar-L-NH- with or without the presence of solvent at  
 5 temperatures from 25 to 200 °C to give product  
 (XXV). These could be converted to intermediates  
 (XXVI) by reduction of the nitro group under a  
 variety of reducing conditions, such as those used



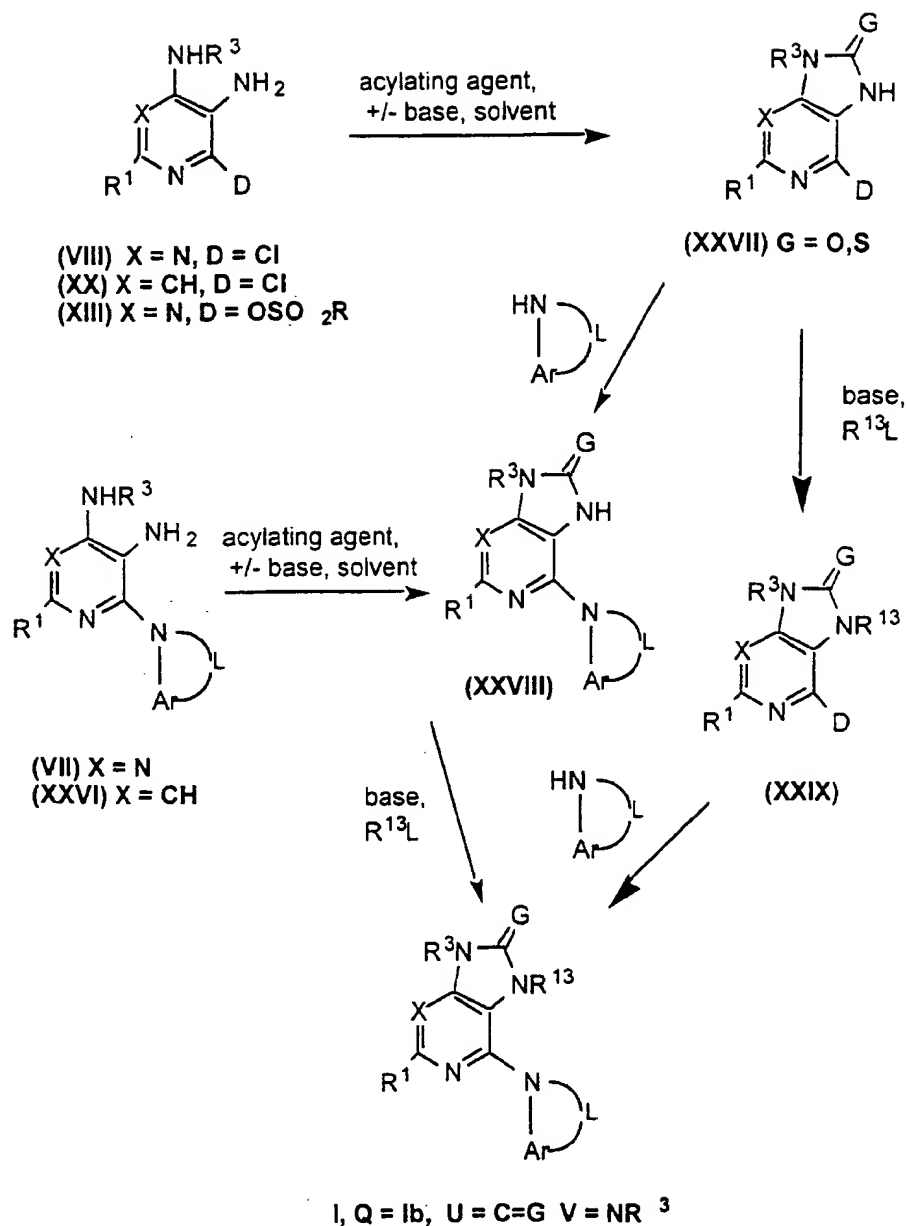
for the conversion of (IV) to (V) in Scheme 1. The final cyclization was carried out as described for the conversion of (VII) to (I) in Scheme 1.

Compounds of Formula (XIX) can be converted to intermediates (XX) by reduction of the nitro group under a variety of reducing conditions, such as those used for the conversion of (IV) to (V) in Scheme 1. Diazotization and cyclization of (XX) can provide chlorotriazolopyridine (XXI) as was described for the conversion of (VII) to (I) in Scheme I. The chloro group can then be displaced by addition of -Ar-L-NH- in the presence of a base in an inert solvent. Bases include, but are not limited to, alkali metal alkoxides, alkali metal hydrides, trialkyl amines, pyridine, 4-dimethylaminopyridine, alkali metal dialkyl amides or alkali metal bis(trimethylsilyl)amides. Inert solvents include, but are not limited to, halocarbons, alkanenitriles, dialkylformamides, dialkylacetamides, dialkyl ethers, cyclic ethers such as tetrahydrofuran or dioxane, or alkyl alcohols. The addition can take place in the presence of an acid such as but not limited to HCl, H<sub>2</sub>SO<sub>4</sub>, AcOH, methanesulfonic acid, p-toluenesulfonic acid in inert solvents such as toluene, xylenes at temperatures ranging from 0 ° to 200 °C to afford product I. The same transformation can be affected under thermal conditions, neat, or in the presence of a high boiling solvent.

Imidazolopyridines can be synthesized from intermediates of Formula (XXII) as described in Scheme 6.

Compounds of general Formula (I, Q is Ib) may be prepared according to the procedures outlined in Scheme 8.

## Scheme 8



Intermediates of Formula (VIII), (XX) or (XIII) may  
 5 be converted to compounds of Formula (XXVII) by  
 treatment with an acylating agent in the presence or  
 absence of a base in an inert solvent at reaction  
 temperatures ranging from -78 °C to 200 °C.  
 Acylating agents include, but are not limited to,  
 10 phosgene, thiophosgene, diphosgene, triphosgene,

carbonyl diimidazole, thiocarbonyl diimidazole, dialkylcarbonates (such as diethyl carbonate) or  $R^aR^bN(C=G)OR^c$  (where G is O, S;  $R^a$ ,  $R^b$ , and  $R^c$  are independently C1-C8 alkyl). Bases include, but are not limited to, alkali metal alkoxides, alkali metal hydrides, trialkyl amines, pyridine, 4-dimethylaminopyridine, alkali metal dialkyl amides or alkali metal bis(trimethylsilyl)amides. Inert solvents include, but are not limited to, halocarbons, alkanenitriles, dialkylformamides, dialkylacetamides, dialkyl ethers, cyclic ethers such as tetrahydrofuran or dioxane, or alkyl alcohols. Intermediates of Formula (XXVII) may be converted to compounds of Formula (XXVIII) (Formula (I), where Q is Ib and  $R^{13}$  is H) by reaction with  $-Ar-L-NH-$ , using the conditions described for the conversion of compound (V) to (VI) in Scheme 1. Compounds of Formula (XXVIII) may be converted to compounds of (Formula (I), where Q is Ib) by treatment with  $R^{13}L$  (where L is a leaving group such as halide, alkanesulfonate or arylsulfonate) in the presence or absence of a base in an inert solvent. Bases include, but are not limited to, alkali metal alkoxides, alkali metal hydrides, trialkyl amines, pyridine, 4-dimethylaminopyridine, alkali metal dialkyl amides or alkali metal bis(trimethylsilyl)amides. Inert solvents include, but are not limited to, halocarbons, alkanenitriles, dialkylformamides, dialkylacetamides, dialkyl ethers, cyclic ethers such as tetrahydrofuran or dioxane, or alkyl alcohols.

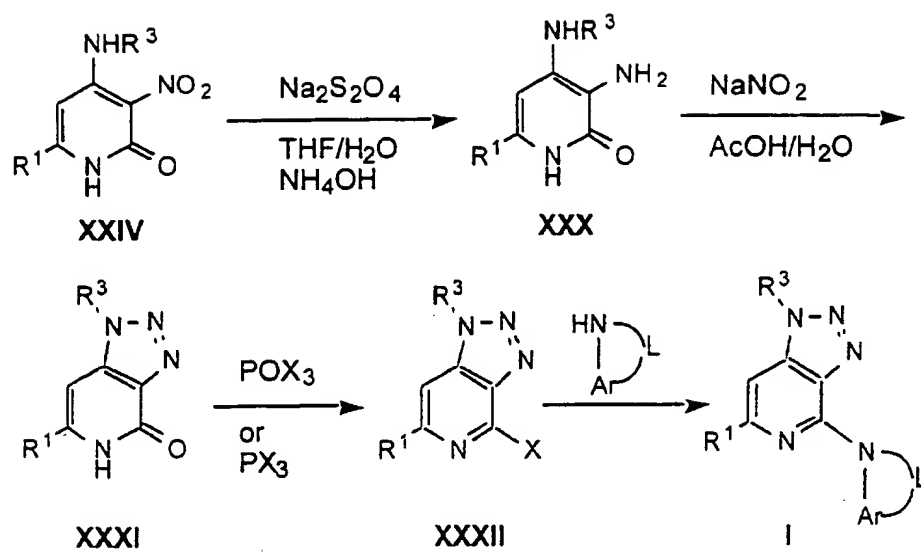
Compounds of Formula (XXIX) may be prepared from compounds of structure (XXVII) by reaction with  $R^{13}L$  (where L is a leaving group such as halide, alkanesulfonate or arylsulfonate) in the presence or absence of a base in an inert solvent. Bases and inert solvents may be the same as those

listed above for the preparation of compounds of Formula (I), (where Q is Ib) from (XXVIII). Intermediates of Formula (XXIX) can be reacted with -Ar-L-NH- to give compounds of Formula (I), (where Q is Ib) using the conditions described for the conversion of compound (V) to (VI) in Scheme 1. Alternatively intermediates of Formula (VII) and (XXVI) can be converted to compounds of Formula (XXVIII) under similar conditions that may be used for the conversion of (VIII), (XX) or (XIII) to (XXVII).

As shown in Scheme 9, reaction of a 4-alkylamino-3-nitro-pyridone of Formula (XXIV) with a reducing agent, such as  $\text{Na}_2\text{S}_2\text{O}_4$  affords the corresponding 4-amino-3-amino-pyridone of Formula (XXX). This transformation can be effected under a variety of reducing conditions, such as catalytic hydrogenation, reducing metal reaction (Fe, Sn, Zn), hydride reaction ( $\text{NaBH}_4$ ,  $\text{LiAlH}_4$ ) etc., which are known to those skilled in the art. The 4-amino-3-amino-pyridone can be converted to the triazolopyridone of formula (XXXI) by treatment with an alkali metal nitrite, such as  $\text{NaNO}_2$ , under acidic conditions. The resulting triazolopyridone can be converted to the corresponding halo-triazolopyridine of Formula (XXXII) (X is Cl or Br), by treatment with a halogenating agent such as  $\text{POCl}_3$ ,  $\text{PBr}_3$ ,  $\text{POBr}_3$ . Alternatively X can be an appropriate leaving group resulting from treatment of the triazolopyridone with triflic, tosic or mesyl anhydride in the presence of a base. The triazolopyridine can be coupled with arylamines -Ar-L-NH- under acidic, basic or thermal catalysis (conditions described in Scheme 7) to compounds of Formula I.

35

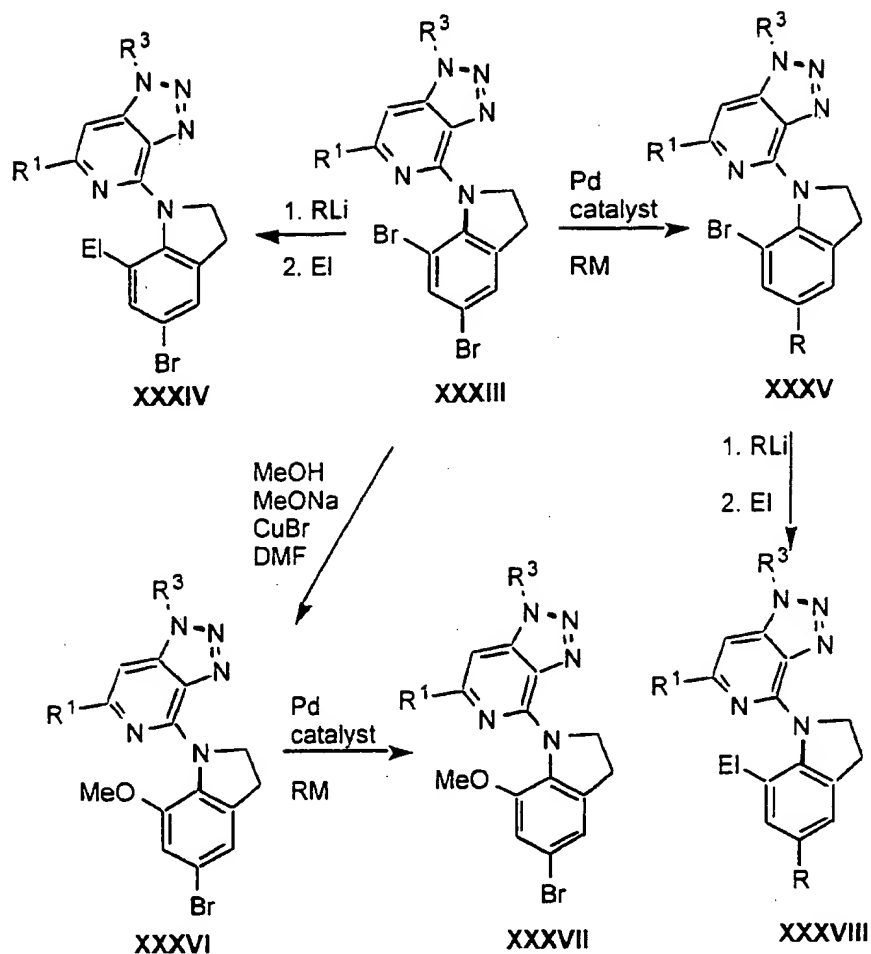
Scheme 9



5

The  $R^5$  substituents on the aryl ring can be further modified by reactions described in Scheme 10.

Scheme 10



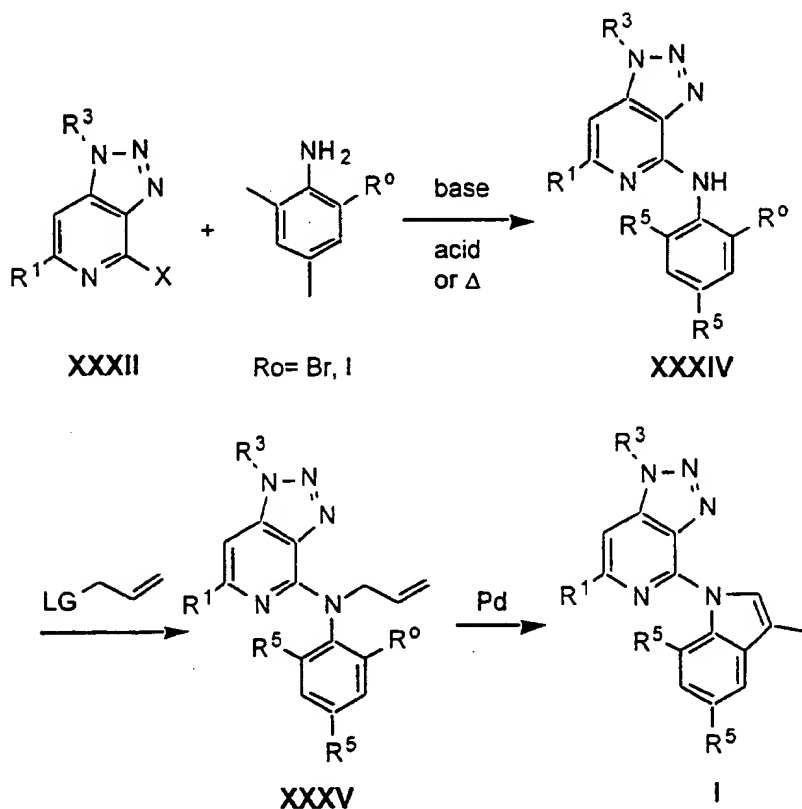
- 5 The dibromo analog (XXXIII) of Formula (I) (where X is CH, Y is N, L is CH<sub>2</sub>-CH<sub>2</sub>) was treated with an alkyl lithium such as n-butyllithium in an aprotic solvent at low temperature to affect Br/Li exchange. The aryllithium intermediate was further reacted with
- 10 an electrophile to give the 7-substituted analog (XXXIV). Alternatively the 5-bromo substituent of the indoline could selectively react with various vinyltrialkyltin, vinylboronic acid reagents, or thiol salts in the presence of a palladium catalyst to give
- 15 the 5-substituted analogs of Formula (XXXV). These analogs could be further reacted with an alkyl lithium followed by an electrophile to give analogs of Formula (XXXVIII).

Compounds of Formula (XXXIII) could be converted to the 7-methoxy analogs (XXXVI) by treatment with MeONa/MeOH in DMF under copper (I) salt catalysis. The 5-bromo substituent of these analogs could be further

5 elaborated by the employing conditions described for the transformation of (XXXV) to (XXXVIII). In all cases the indoline ring may be dehydrogenated to the corresponding indole analogs by employing known methods described in the chemical literature.

10 Compounds of Formula I may be synthesized as described in Scheme 11.

Scheme 11



15

Coupling a suitably substituted aniline having an ortho -Br, -I, or -OSO<sub>2</sub>CF<sub>3</sub> group with a triazolopyridine of Formula (XXXII) under base, acid or thermal catalysis

20 gives the coupled product of Formula (XXXIV). The central nitrogen of (XXXIV) was allylated by treatment

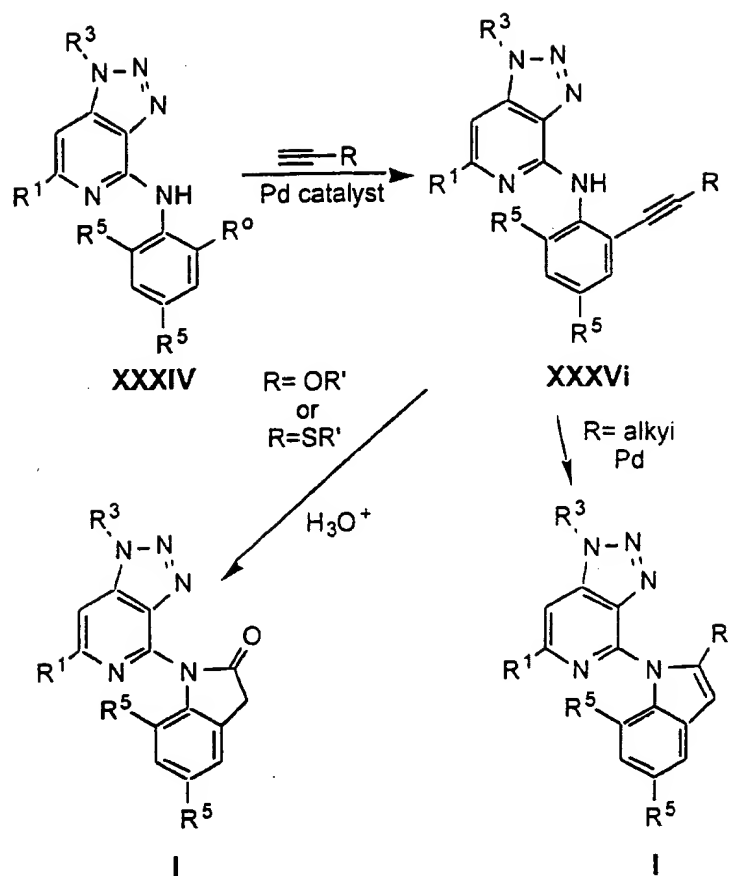
with a base such as NaH in an aprotic solvent to give (XXXV). This in turn may be subjected to a palladium-catalyzed ring closure (see: Larock, R.C et. al. *Tetrahedron Let.*, **1987**, 44, 5291) to give compounds of  
5 Formula (I) (L is  $-\text{CH}=\text{CR}-$ ).

Alternatively other analogs with the Formula (I) can be obtained by transformations described on Scheme 12.

Reaction of compounds of Formula (XXXIV) with a  
10 suitably substituted acetylene using a suitable palladium catalyst (see: Heck, R.F. et. al. *Acc. Chem. Res.*, **1979**, 12, 146) may provide the corresponding acetylenic aryls of Formula (XXXVI). Depending on the original substitution on the acetylene, compounds of  
15 Formula (XXXVI) can be converted to the 2-alkylindole analogs (Formula I in which L is  $-\text{CR}=\text{CH}-$ ), or the indolinones (Formula I in which L is  $-\text{CO}-\text{CH}_2-$ ).

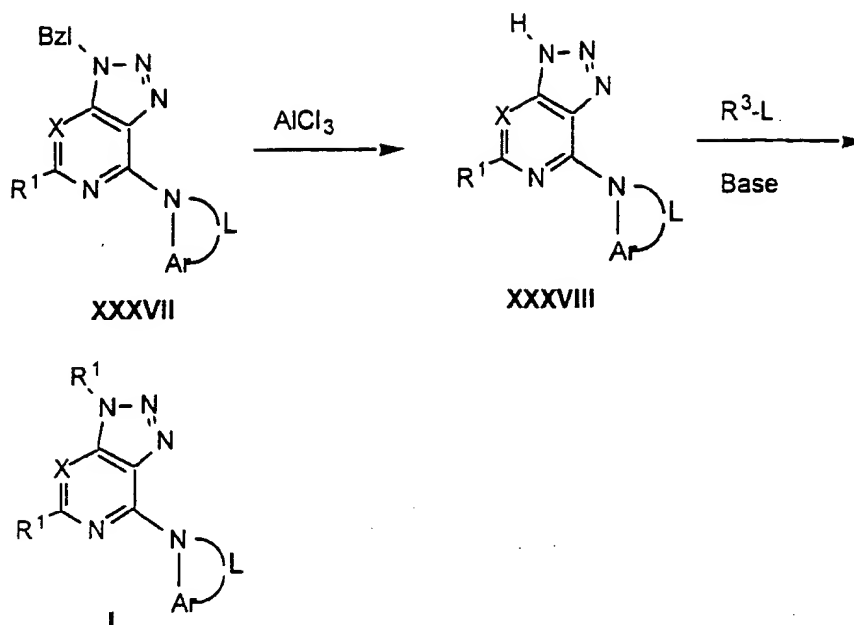


Scheme 12



- 5 An alternative method for the introduction of various side chains is described in Scheme 13:

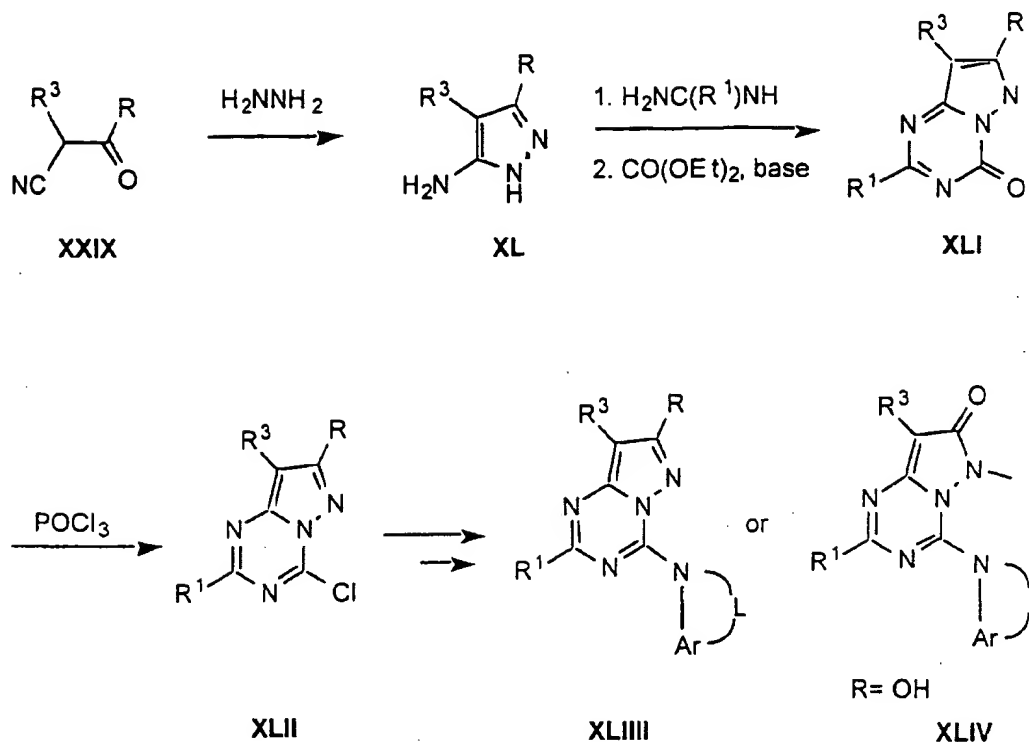
**Scheme 13**



5           The benzyltriazolopyridine or pyrimidine (XXXVII) may be synthesized by one of the previously described Schemes. The benzyl group is cleaved by the action of a strong acid or Lewis acid such as  $AlCl_3$  and the resulting system of Formula (XXXVIII) is alkylated by  
10 treatment with a strong base, followed by an electrophile, or by a method described for the introduction of a functional group on a triazole by Katrinsky, A.R in *Comprehensive Heterocyclic Chemistry the Structure, Reactions Synthesis and Uses of*  
15 *Heterocyclic Compounds and Comprehensive Heterocyclic Chemistry II: a review of the literature, 1982-1995: the Structure, Reactions Synthesis and Uses of Heterocyclic Compounds* to give compounds of Formula (I). Pyrazolo-, imidazolo, and indolo analogs can be  
20 synthesized in an analogous manner. Other heterocyclic linkers may be synthesized by methods described in the above references.

Other ring systems of the present invention can be  
25 synthesized according to Scheme 14:

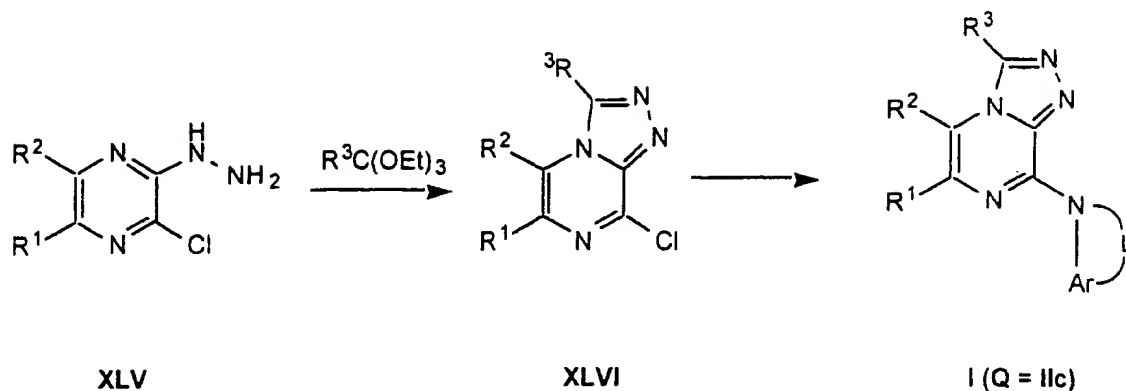
Scheme 14



The cyano compounds of Formula (XXXIX) may be condensed with hydrazine to give compounds of Formula (XL). These may be condensed with amidines, followed by a cyclization with a carbonate in the presence of a base to give compounds of Formula (XLI). Compounds of Formula (XLI) may be converted to the chlorode (XLII) and further coupled with compounds -Ar-L-NH- to give compounds of Formula (XLIII) or (XLIV), depending on the structure of the starting compounds of Formula (XXXIX).

Another ring system of this invention may be synthesized as shown in Scheme 15.

## Scheme 15

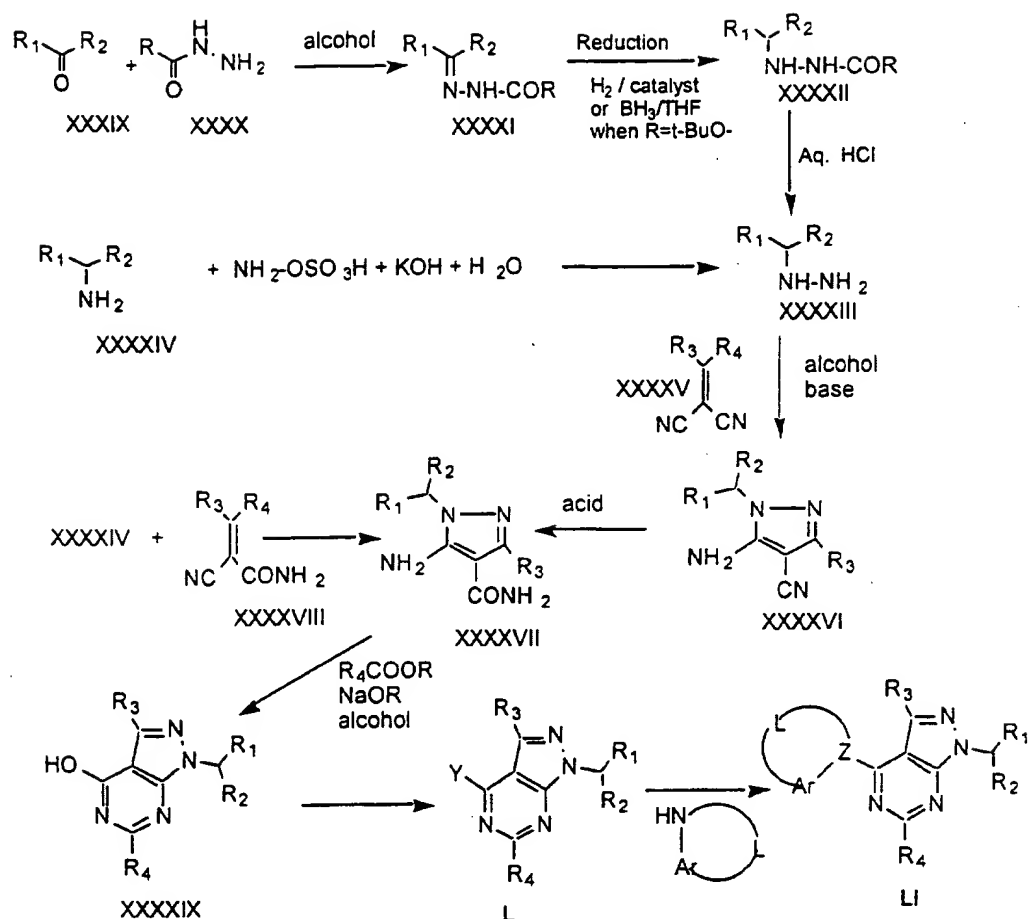


5

The known pyrazines (see: Huynh-Dinh et. al. *J. Org. Chem.* **1979**, 44, 1028) of Formula (XLV) could be converted to the fused systems of Formula (XLVI) via the action of an triethylorthoester. Compounds of Formula (XLVI) could be coupled with compounds -Ar-L-NH- to give compounds of Formula (I), (where Q is IIc).

Pyrazolopyrimidines (LI) of the present invention may be readily synthesized by following the reaction sequence outlined in Scheme 17 shown below.

Scheme 17



Alkylhydrazines of the type (XXXII) were readily prepared by reacting ketone (XXXIX) with acetylhydrazide or t-butylcarbazate (XXXX) to afford hydrazone (XXXI) which can readily be reduced using catalytic hydrogenation or by treatment with borane to give (XXXII). XXXII can readily be converted to XXXIII in the presence of aq. acid (see: N.I Ghali et al J. Org. Chem. 1981, 46, 5413-14 and Boissier et al French patent M4306, 1966). Alternatively alkylhydrazines (XXXIII) may be readily prepared from amines (XXXXIV) using hydroxylamine-O-sulfonic acid in the presence of base (See Gever et al. J. Org. Chem. 1949, 14, 813). Treatment of compound (XXXIII) with

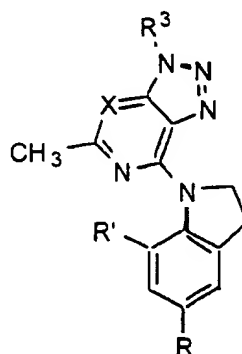
ethylidene malononitrile (XXXXV) in alcohol medium in the presence or absence of base such as alkylamines to afford pyrazole derivative (XXXXVI). The nitrile group in the pyrazole derivative can readily be hydrolyzed using acids such as sulfuric acid, to give pyrazole carboxamide derivative (XXXXVII). Alternatively pyrazole carboxamides (XXXXVIII) can be prepared by reacting (XXXXIII) with (XXXXVIII) in solvents such as alcohol in the presence of a base. Pyrazolopyrimidones of the formula (XXXXIX) can be obtained by treatment with esters in the presence of a base such as alkali metal alkoxides in refluxing alcohol (for example, see: Miyashita et al, Heterocycles, 1996, 42(2), 691). The hydroxy group of pyrazolopyrimidones (XXXXIX) can be converted to a leaving group Y (eg. tosylate, mesylate, triflate, or halogen) using classical organic group transformations to afford formula (L). Formula (L) can readily be converted to compounds of the present invention (LI) upon treatment with -Ar-L-NH- either as a neat reaction mixture at elevated temperatures or in the presence of a base in solvents such as THF, alkyl ethers or dialkylformamides.

Other ring systems can be synthesized by methods described in EP 0 778277 A1, WO 9413677 and WO 9413696.

The following examples are provided to describe the invention in further detail. These examples, which set forth the best mode presently contemplated for carrying out the invention, are intended to illustrate and not to limit the invention.

Compounds which may be prepared using the synthetic Schemes 1-14 are listed in the following Tables 1-3.

**Table 1**  
**4-(2,3-dihydro-1H-indol-1-yl)-1H-1,2,3-triazolo[4,**  
**5-c]pyridines and pyrimidines:**



5

	Ex. No.	X	R <sub>3</sub>	R	R'	mp
10	1	CH	CH(CH <sub>2</sub> OCH <sub>3</sub> )C <sub>2</sub> H <sub>4</sub> OCH <sub>3</sub>	Br	Br	136-138
	2 (S) -	CH	CH(CH <sub>2</sub> OCH <sub>3</sub> )C <sub>2</sub> H <sub>4</sub> OCH <sub>3</sub>	Br	Br	125-127
	3	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	Br	Br	168-170
	4	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	Br	OCH <sub>3</sub>	138-140
	5 (S) -	CH	CH(CH <sub>2</sub> OCH <sub>3</sub> )C <sub>2</sub> H <sub>4</sub> OCH <sub>3</sub>	Br	OCH <sub>3</sub>	129-131
15	6	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	Br	Me	147-150
	7	CH	CH(CH <sub>2</sub> OCH <sub>3</sub> )C <sub>2</sub> H <sub>4</sub> OCH <sub>3</sub>	Br	CHO	124-126
	8	CH	CH(CH <sub>2</sub> OCH <sub>3</sub> )C <sub>2</sub> H <sub>4</sub> OCH <sub>3</sub>	Br	CH <sub>2</sub> OH	142-144
	9	CH	CH(CH <sub>2</sub> OCH <sub>3</sub> )C <sub>2</sub> H <sub>4</sub> OCH <sub>3</sub>	Br	CH <sub>2</sub> OCH <sub>3</sub>	120-122
	10	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	Br	Cl	163-165
20	11	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	OCH <sub>3</sub>	OCH <sub>3</sub>	109-111
	12	CH	CH(CH <sub>2</sub> OCH <sub>3</sub> )C <sub>2</sub> H <sub>4</sub> OCH <sub>3</sub>	Br	Cl	
	13	CH	CH(CH <sub>2</sub> OCH <sub>3</sub> )C <sub>2</sub> H <sub>4</sub> OCH <sub>3</sub>	OCH <sub>3</sub>	Cl	
	14	CH	CH(CH <sub>2</sub> OCH <sub>3</sub> )C <sub>2</sub> H <sub>4</sub> OCH <sub>3</sub>	Et	Cl	
	15	CH	CH(CH <sub>2</sub> OCH <sub>3</sub> )C <sub>2</sub> H <sub>4</sub> OCH <sub>3</sub>	Me	Cl	
25	16	CH	CH(CH <sub>2</sub> OCH <sub>3</sub> )C <sub>2</sub> H <sub>4</sub> OCH <sub>3</sub>	Cl	Cl	
	17	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	Cl	Cl	
	18	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	Me	Cl	
	19	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	OCH <sub>3</sub>	Cl	137-140
	20	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	CN	Cl	
30	21	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	SCH <sub>3</sub>	Cl	
	22	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	SO <sub>2</sub> CH <sub>3</sub>	Cl	

	23	CH	CH(C <sub>2</sub> H <sub>4</sub> OMe) <sub>2</sub>	Cl	Cl	119-120
	24	CH	CH(C <sub>2</sub> H <sub>4</sub> OMe) <sub>2</sub>	Br	Br	117-118
	25	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	Cl	Cl	140-142
	26	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	Me	Cl	
5	27	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	OCH <sub>3</sub>	Cl	
	28	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	CN	Cl	
	29	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	SMe	Cl	
	30	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	SO <sub>2</sub> CH <sub>3</sub>	Cl	
	31	CH	CH(Et) <sub>2</sub>	Cl	Cl	168-171
10	32	CH	CH(Et) <sub>2</sub>	Br	Cl	168-171
	33	CH	CH(Et) <sub>2</sub>	OCH <sub>3</sub>	Cl	152-153
	34	CH	CH(Et) <sub>2</sub>	CN	Cl	204-206
	35	CH	CH(Et) <sub>2</sub>	SCH <sub>3</sub>	Cl	129-131
	36	CH	CH(Et) <sub>2</sub>	SO <sub>2</sub> CH <sub>3</sub>	Cl	
15	37	CH	CH(Et) <sub>2</sub>	Br	Br	183-186
	38	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	Cl	Me	
	39	CH	CH <sub>2</sub> Ph	Br	Br	189-191
	40	CH	CH <sub>2</sub> Ph	Cl	Cl	205-206
	41	CH	nBu	Cl	Cl	a
20	42	CH	iPr	Cl	Cl	
	43	CH	CH(Et)Me	Cl	Cl	
	44	CH	CH <sub>2</sub> iPr	Cl	Cl	210-213
	45	CH	nC <sub>5</sub> H <sub>11</sub>	Cl	Cl	166-167
	46	CH	CH(cPr) <sub>2</sub>	Cl	Cl	233-236
25	47	CH	CH(nPr) <sub>2</sub>	Cl	Cl	157-159
	48	N	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	Br	Br	215-217
	49	N	CH(Et) <sub>2</sub>	Cl	Cl	220-221
	50	N	CH(Et) <sub>2</sub>	Me	Cl	
	51	N	CH(Et) <sub>2</sub>	OCH <sub>3</sub>	Cl	202-204
30	52	N	CH(Et) <sub>2</sub>	CN	Cl	
	53	N	CH(Et) <sub>2</sub>	SMe	Cl	
	54	N	CH(Et) <sub>2</sub>	SO <sub>2</sub> Me	Cl	
	55	CH	CH(Et) <sub>2</sub>	COCH <sub>3</sub>	Cl	212-214
	56	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	Cl	Br	151-153
35	57(R)	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	Cl	Cl	158-160
	58(S)	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	Cl	Cl	159-162
	59(R)	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	OCH <sub>3</sub>	Cl	150-152



	60 (S)	CH	CH (Et) CH <sub>2</sub> OCH <sub>3</sub>	OCH <sub>3</sub>	Cl	149-151
	61	CH	CH (Et) C <sub>2</sub> H <sub>4</sub> OMe	Et	Cl	oil
	63	CH	CH (Et) CH <sub>2</sub> OCH <sub>3</sub>	Br	CF <sub>3</sub>	194-196
	64 (R)	CH	CH (Et) CH <sub>2</sub> OCH <sub>3</sub>	OCF <sub>3</sub>	Cl	74-76
5	65 (S)	CH	CH (Et) CH <sub>2</sub> OCH <sub>3</sub>	OCF <sub>3</sub>	Cl	74-76
	66 (R)	CH	CH (Et) CH <sub>2</sub> OCH <sub>3</sub>	Cl	OCF <sub>3</sub>	149-151
	67 (S)	CH	CH (Et) CH <sub>2</sub> OCH <sub>3</sub>	Cl	OCF <sub>3</sub>	150-151
	68	CH	CH (Et) CH <sub>2</sub> CN	Cl	Cl	194-196
	69	N	CH (Et) nPr	Cl	Cl	213-215
10	70	N	CH (CH <sub>3</sub> ) nPr	Cl	Cl	165-167
	71	N	CH (nPr) <sub>2</sub>	Cl	Cl	209-212
	72	N	CH (Et) CH <sub>2</sub> OCH <sub>3</sub>	Cl	Cl	204-206
	73	N	CH (Et) nPr	OCH <sub>3</sub>	Cl	213-215
	74	N	CH (Et) CH <sub>2</sub> OCH <sub>3</sub>	OCH <sub>3</sub>	Cl	162-163
15	75	CH	CH (Et) C <sub>2</sub> H <sub>4</sub> OCH <sub>3</sub>	OCH <sub>3</sub>	Cl	131-132
	76	CH	CH (Et) CH <sub>2</sub> cPr	Cl	Cl	151-152
	77	CH	CH (Et) <sub>2</sub>	OCH <sub>3</sub>	CH <sub>3</sub>	148-149
	78	CH	CH (Et) CH <sub>2</sub> cPr	OCH <sub>3</sub>	Cl	90-92
	79	CH	CH (CH <sub>2</sub> OCH <sub>3</sub> ) CH <sub>2</sub> cPr	Cl	Cl	138-140
20	80	CH	CH (CH <sub>2</sub> OCH <sub>3</sub> ) CH <sub>2</sub> cPr	OCH <sub>3</sub>	Cl	107-109
	81	CH	CH (Et) <sub>2</sub>	Cl	Br	166-167
	82	CH	CH (Et) <sub>2</sub>	Cl	OCH <sub>3</sub>	152-154
	83	CH	CH (CH <sub>3</sub> ) Et	Cl	Cl	158-160
	84	CH	CH (CH <sub>3</sub> ) nPr	Cl	Cl	177-179
25	85	CH	CH (Et) <sub>2</sub>	Br	H	161-163
	86	CH	CH (Et) CO <sub>2</sub> CH <sub>3</sub>	Cl	Cl	217-218
	87 (R)	CH	CH (Et) CH <sub>2</sub> OCH <sub>3</sub>	Br	Cl	161-164
	88 (S)	CH	CH (Et) CH <sub>2</sub> OCH <sub>3</sub>	Br	Cl	161-164
	89 (S)	CH	CH (Et) CH <sub>2</sub> OCH <sub>3</sub>	Et	Cl	115-116
30	90 (S)	CH	CH (Et) CH <sub>2</sub> OCH <sub>3</sub>	CH <sub>3</sub>	Cl	166-169
	91	CH	CH (CH <sub>3</sub> ) cPr	Cl	Cl	170-172
	92	CH	CH (CH <sub>3</sub> ) cPr	OCH <sub>3</sub>	Cl	137-141
	93	CH	CH (Et) nPr	Cl	Cl	153-156
	94	CH	CH (Et) nPr	OCH <sub>3</sub>	Cl	122-125
35	95	CH	CH (CH <sub>3</sub> ) Et	OCH <sub>3</sub>	Cl	102-105
	96	CH	CH (Et) CH <sub>2</sub> (1,2,4-triazole)	Cl	Cl	199-202
	97	CH	CH (CH <sub>3</sub> ) nPr	OCH <sub>3</sub>	Cl	158-161

	98	CH	CH(Et)CH <sub>2</sub> Oallyl	Cl	Cl	112-114
	99	CH	CH(Et)CH <sub>2</sub> Oallyl	OCH <sub>3</sub>	Cl	amorphous
	100	CH	CH(Et)CH <sub>2</sub> Obenzyl	Cl	Cl	108-109
	101	CH	CH(Et)CH <sub>2</sub> OH	Cl	Cl	175-178
5	102	CH	CH(Et)CH <sub>2</sub> (1,2,3,5-tetrazole)	Cl	Cl	203-206
	103	CH	CH(Et)CH <sub>2</sub> OEt	Cl	Cl	133-135
	104	CH	CH(Et)CH <sub>2</sub> OcPr	Cl	Cl	113-115

10

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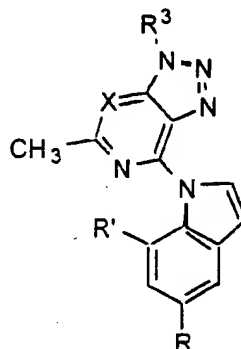
25

30

35

Table 2  
4-(1-H-indol-1-yl)-1H-1,2,3-triazolo[4,5-c]  
pyridines and pyrimidines:

5



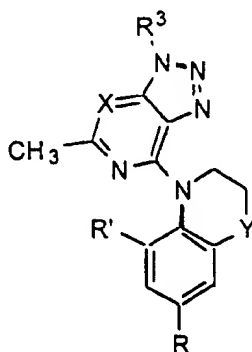
	Ex. No.	X	R <sub>3</sub>	R	R'	mp
10	151	CH	CH(Et)CH <sub>2</sub> OMe	Br	OMe	
	152	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	Br	Me	
	153	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	Cl	Cl	
	154	CH	CH(CH <sub>2</sub> OMe)C <sub>2</sub> H <sub>4</sub> OMe	Br	Cl	
15	155	CH	CH(CH <sub>2</sub> OMe)C <sub>2</sub> H <sub>4</sub> OMe	OMe	Cl	
	156	CH	CH(CH <sub>2</sub> OMe)C <sub>2</sub> H <sub>4</sub> OMe	Cl	Cl	
	157	CH	CH(Et) <sub>2</sub>	Cl	Cl	
	158	CH	CH(Et) <sub>2</sub>	Me	Cl	
	159	CH	CH(Et) <sub>2</sub>	OMe	Cl	
20	160	CH	CH(Et) <sub>2</sub>	CN	Cl	
	161	CH	CH(Et) <sub>2</sub>	SMe	Cl	
	162	CH	CH(Et) <sub>2</sub>	SO <sub>2</sub> Me	Cl	
	163	CH	CH(C <sub>2</sub> H <sub>4</sub> OMe) <sub>2</sub>	Cl	Cl	
	164	CH	CH(C <sub>2</sub> H <sub>4</sub> OMe) <sub>2</sub>	Me	Cl	
25	165	CH	CH(Et)C <sub>2</sub> H <sub>4</sub> OMe	Cl	Cl	
	166	CH	CH(Et)C <sub>2</sub> H <sub>4</sub> OMe	Me	Cl	
	167	CH	CH(Et)C <sub>2</sub> H <sub>4</sub> OMe	OMe	Cl	
	168	CH	CH(Et)C <sub>2</sub> H <sub>4</sub> OMe	CN	Cl	
	169	CH	CH(Et)C <sub>2</sub> H <sub>4</sub> OMe	SMe	Cl	
30	170	CH	CH(Et)C <sub>2</sub> H <sub>4</sub> OMe	SO <sub>2</sub> Me	Cl	
	171	CH	CH(Et) <sub>2</sub>	Cl	Cl	

	172	CH	CH(Et) <sub>2</sub>	Me	Cl	
	173	CH	CH(Et) <sub>2</sub>	OMe	Cl	
	174	CH	CH(Et) <sub>2</sub>	CN	Cl	
	175	CH	CH(Et) <sub>2</sub>	SMe	Cl	
5	176	CH	CH(Et) <sub>2</sub>	SO <sub>2</sub> Me	Cl	
	177	CH	CH(CH <sub>2</sub> OMe)C <sub>2</sub> H <sub>4</sub> OMe	Me	Me	
	178	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	Cl	Me	
	179	N	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	Br	Br	
	180	CH	CH(Et) <sub>2</sub>	Cl	Cl	
10	181	CH	CH(Et) <sub>2</sub>	Me	Cl	
	182	CH	CH(Et) <sub>2</sub>	OMe	Cl	
	183	CH	CH(Et) <sub>2</sub>	CN	Cl	
	184	CH	CH(Et) <sub>2</sub>	SMe	Cl	
	185	CH	CH(Et) <sub>2</sub>	SO <sub>2</sub> Me	Cl	
15	186	CH	CH(Et)CH <sub>2</sub> OCH <sub>3</sub>	Br	Br	amorphous

20

Table 3

1,2,3,4-tetrahydro-1H-1,2,3-triazolo[4,5-c]  
pyridin-4-yl and pyrimidin-4-yl quinolines



25

Ex. No.	X	R <sub>3</sub>	R	R'	Y	mp
286	CH	CH(Et)CH <sub>2</sub> OMe	Me	H	CH <sub>2</sub>	126-128
30 287	CH	CH(Et)CH <sub>2</sub> OMe	Me	Br	CH <sub>2</sub>	111-113
288	CH	CH(Et)CH <sub>2</sub> OMe	Me	Cl	CH <sub>2</sub>	110-112

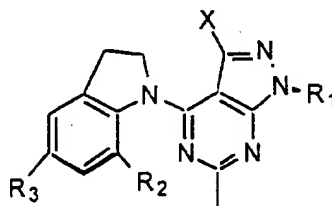
289	CH	CH(CH <sub>2</sub> OMe)C <sub>2</sub> H <sub>4</sub> OMe	Me	Cl	CH <sub>2</sub>	107-109
290	CH	CH(Et)CH <sub>2</sub> OMe	Me	Br	O	105-107
291	CH	CH(Et) <sub>2</sub>	Me	Cl		
292	CH	CH(Et) <sub>2</sub>	Me	Cl		

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The compound of Example 400 and the other compounds listed shown in Table 4 were prepared using the synthetic procedure of Scheme 17 and the reaction conditions outlined in Example 400.

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Table 4



20

Ex. No.	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	X	mp (°C)
400	CH(Et) <sub>2</sub>	Br	Br	Me	190-191
25 401	CH(Et) <sub>2</sub>	Cl	Cl	Me	164-166
402	CH(Et)C-CH		Cl	Cl	Me 82-84
403	CH(Et) <sub>2</sub>	Br	Br	H	191-192
404	CH(Et) <sub>2</sub>	Cl	Cl	H	180-181
405	CH(Me){ (CH <sub>2</sub> ) <sub>2</sub> -Me }	Cl	Cl	Me	131-132
30 406	CH(Me){ (CH <sub>2</sub> ) <sub>2</sub> -Me }	Cl	Br	Me	138-140
407	CH(Me){ (CH <sub>2</sub> ) <sub>2</sub> -Me }	Br	Br	Me	147-149
408	CH(Me){ (CH <sub>2</sub> ) <sub>2</sub> -Me }	H	OMe	Me	133-135
409	CH(Me){ (CH <sub>2</sub> ) <sub>2</sub> -Me }	Cl	OMe	Me	115-117
410	CH(Et) <sub>2</sub>	Cl	OMe	Me	162-16
35 411	CH(Me){ (CH <sub>2</sub> ) <sub>2</sub> -Me }	H	Cl	Me	103-105

-78-

412	CH(Me){ (CH <sub>2</sub> ) <sub>3</sub> -OMe }	Cl	Cl	Me	oii
413	CH(Me){ (CH <sub>2</sub> ) <sub>2</sub> -Me }	H	Br	Me	107-109
414	benzyl	Cl	Cl	Me	145-146

5

**Example 1**

**Preparation of (S)-4-(5,7-dibromo-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine**

10

**Part A:** L-Dimethyl aspartate hydrochloride (5 g, 25.3 mmol) and triphenylmethyl chloride (7.65 g, 27.5 mmol) were suspended in dry CH<sub>3</sub>CN (50 mL) at 0 °C. To that Et<sub>3</sub>N (4.5 mL, 32.3 mmol) was added dropwise, followed by N-methylmorpholine (2.5 mL, 27.5 mmol). The mixture was stirred at 0 °C for 1 h and at 25 °C for 30 min. Then it was partitioned between EtOAc (200 mL) and water (50 mL) and the organic extract was washed with water (50 mL), brine (50 mL), dried (MgSO<sub>4</sub>) and stripped in vacuo. The product, diethyl N-triphenylmethyl aspartate, was >90% clean by NMR analysis.

NMR(CDCl<sub>3</sub>) δ 7.16-7.51 (m, 15 H), 3.68 (s, 3H), 3.66-3.74 (m, 1H), 3.26 (s, 3H), 2.93 (d, 1H, J=9.9Hz), 2.63-2.69 (dd, 1H, J<sub>1</sub>=14.6, J<sub>2</sub>=5.1 Hz), 2.48-2.55 (dd, 1H, J<sub>1</sub>=14.6 Hz, J<sub>2</sub>=7 Hz).

**Part B:** (S)-Diethyl N-triphenylmethyl aspartate (~25 mmol) was dissolved in dry THF (150 mL) and cooled to 0 °C. To that a 1 M solution of LiAlH<sub>4</sub> in THF (50 mL, 50 mmol) was added dropwise and the reaction was stirred for 2 h and allowed to warm to 25 °C. Then it was cooled and quenched with water (5 mL) and 1 N NaOH (4 mL), diluted with ether (200 mL) and the precipitated solids were filtered off. The filtrate was concentrated in vacuo to give the product, 2-N-

triphenylamino-1,4-butane diol (>90% clean by NMR analysis).

NMR(CDCl<sub>3</sub>) δ 7.17-7.57 (m, 15H), 3.68-3.77 (m, 1H), 3.56-3.63 (m, 1H), 3.19 (d, 1H, J=8.8 Hz), 2.76-2.86 (m, 2H), 2.2-2.7 (br, 3H), 1.54-1.63 (m, 1H), 1.36-1.54 (m, 1H).

**Part C:** (S)-2-N-triphenylamino-1,4-butane diol (~25 mmol) dissolved in dry THF (50 mL) was added into a suspension of NaH 60% in oil (2.34 g, 58.5 mmol) in dry THF (50 mL) at 0 °C, and the mixture was stirred at 9 °C for 30 min and at 25 °C for 1 h. Then it was cooled in an ice bath and CH<sub>3</sub>I (3.6 mL, 58.5 mmol) was added dropwise. The reaction was stirred at 0 °C for 30 min and at 25 °C for 2 h, the excess NaH was quenched with water and the THF was stripped off. The residue was partitioned between EtOAc (200 mL) and water (50 mL) and the organic extract was washed with water (50 mL), brine (50 mL), dried (MgSO<sub>4</sub>) and stripped in vacuo. The product, 2-N-triphenylamino-1,4-dimethoxy butane was >90% clean by NMR analysis.

NMR(CDCl<sub>3</sub>) δ 7.15-7.59 (m, 15 H), 3.34-3.41 (m, 1H), 3.22 -3.30 (m, 1H), 3.24 (s, 3H), 3.03 (s, 3H), 2.86 (dd, 1H, J<sub>1</sub>=9.5 Hz, J<sub>2</sub>=3.3 Hz), 2.65-2.75 (m, 1H), 2.4-2.46 (br, 1H), 2.30-2.35 (m, 1H), 2.57-2.8 (m, 2H).

**Part D:** (S)-2-N-Triphenylamino-1,4-dimethoxy butane (~25 mmol) was dissolved in a mixture of CH<sub>2</sub>Cl<sub>2</sub> (100 mL) and methanol (50 mL) and 1 M HCl in ether was added (50 mL). The reaction was stirred at 25 °C for 16 h, the solvent was stripped off and the residue was washed with 1:1 ether/hexane (3x50 mL). The remaining oil, 2-amino-1,4-dimethoxybutane hydrochloride, was dried under vacuum (3.87 g, 88%).

NMR(CDCl<sub>3</sub>) δ 8.2-8.5 (br, 3H), 3.5-3.7 (m, 5H), 3.41 (s, 3H), 3.36 (s, 3H), 2.05-2.2 (m, 1H), 1.90-2.01 (m, 1H).

- Part E: 4-Chloro-6-methyl-3-nitropyridone:** 4-Hydroxy-6-methyl-3-nitropyridone (4.0 g, 23.52 mmol) was treated with cyclohexylamine (2.8 mL, 24.46 mmol) in MeOH (50 mL) until all dissolved. The MeOH was stripped in vacuo and the resulting salt was dried and treated with POCl<sub>3</sub> (30 mL) at 25 °C for 30 h. The reaction was then poured into ice/water (400 mL) and extracted with EtOAc (2x200 mL). The combined EtOAc extracts were washed with water (100 mL), 1 N NaOH (20 mL), water (100 mL) and brine, dried (MgSO<sub>4</sub>) and stripped in vacuo. The residue was washed with 20% EtOAc/hexanes (2x30 mL) to give the product (2.9 g).
- Part F: (S)-6-Methyl-3-nitro-4-(1-methoxymethyl-3-methoxypropylamino) pyridone:** 1-methoxymethyl-3-methoxypropylamine (4.19 g, 22.3 mmol), and 4-chloro-6-methyl-3-nitropyridone (3.87 g, 22.3 mmol) were mixed in CH<sub>3</sub>CN (70 mL) and diisopropyl-ethylamine (9.4 mL, 53.6 mmol) was added. The reaction was stirred at 25 °C for 16 h and at reflux for 2.5 h. The solvent was stripped off and the residue was dissolved in CH<sub>2</sub>Cl<sub>2</sub> (150 mL) and the CH<sub>2</sub>Cl<sub>2</sub> was washed with water (80 mL). The water was extracted with CH<sub>2</sub>Cl<sub>2</sub> (50 mL) and the combined organic extracts were dried (MgSO<sub>4</sub>) and stripped in vacuo. The residue was crystallized from EtOAc and washed with 40% EtOAc/hexanes to give the product, (4.8 g, 75%).
- NMR(DMSO) δ 9.13 (d, 1H, J=8.8 Hz), 5.9 (s, 1H), 3.92-4.02 (m, 1H), 3.20-3.25 (m, 2H), 3.28-3.4 (m, 2H), 3.25 (s, 3H), 3.18 (s, 3H), 2.09 (s, 3H), 1.65-1.90 (m, 2H).

- Part G: (S)-2-Chloro-6-methyl-3-nitro-N-(1-methoxymethyl-3-methoxypropyl)pyridin-4-amine:** 4-[3-(1,4-dimethoxybutyl)amino]-6-methyl-3-nitropyridone (4.8 g, 16.82 mmol) was dissolved in POCl<sub>3</sub> (50 mL) and stirred at 25 °C for 40 h. Then the reaction was poured



into ice/water (500 mL), allowed to react, neutralized with solid  $\text{NaHCO}_3$  after EtOAc was added (150 mL) and extracted with EtOAc (2x300 mL). The EtOAc was dried ( $\text{MgSO}_4$ ) and stripped in vacuo to give the product.

- 5 NMR ( $\text{CDCl}_3$ )  $\delta$  7.08 (d, 1H,  $J=7.7$  Hz), 6.65 (s, 1H), 3.85-3.95 (m, 1H), 3.30-3.50 (m, 4H), 3.38 (s, 3H), 3.33 (s, 3H), 2.43 (s, 3H), 1.80-2.02 (m, 2H).

- Part H: (S)-3-amino-2-chloro-4-N-(1-methoxymethyl-3-methoxypropyl)-6-methyl-pyridin-4-amine:** 2-Chloro-6-methyl-3-nitro-N-(1-methoxymethyl-3-methoxypropyl)pyridin-4-amine (~16.82 mmol) was heated at reflux with Fe powder (10 g) in methanol (120 mL) in the presence of glacial acetic acid (10 mL) for 2 h.
- 15 Then the iron was filtered through celite, the celite was washed with methanol (80 mL) and the filtrate was stripped in vacuo. The residue was dissolved in 10% HCl (120 mL) and EtOAc was added (160 mL). The mixture was neutralized with solid  $\text{NaHCO}_3$  and the aqueous layer was
- 20 extracted with EtOAc (2x100 mL). The combined organic extracts were washed with brine (50 mL), dried ( $\text{MgSO}_4$ ) and stripped in vacuo (4.1 g).
- NMR( $\text{CDCl}_3$ )  $\delta$  6.4 (s, 1H), 5.2-5.35 (br s, 1H), 3.70-3.80 (m, 1H), 3.2-3.8 (m, 6H), 3.38 (s, 3H), 3.33 (s, 3H),
- 25 2.42 (s, 3H), 1.8-2.0 (m, 2H).

- Part I: (S)-4-chloro-1-(1-methoxymethyl-3-methoxypropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine:** 3-amino-2-chloro-6-methyl-4-N-(1-methoxymethyl-3-methoxypropyl)pyridin-4-amine (4.1 g, 14.98 mmol) was dissolved in a mixture of  $\text{CH}_2\text{Cl}_2$  (40 mL) and 50% acetic acid (40 mL) and cooled to 0 °C in an ice bath. To that a solution of  $\text{NaNO}_2$  (1.84 g, 26.86 mmol) in water (10 mL) was added dropwise and the
- 35 reaction was stirred at 0 °C for 30 min and at 25 °C for 1.5 h. Then the acetic acid was neutralized with solid  $\text{NaHCO}_3$  and water (80 mL) was added. The mixture

was extracted with EtOAc (2x100 mL) and the combined organic extracts were combined and washed with brine (50 mL), dried and stripped in vacuo. The residue was chromatographed on silica gel (40% EtOAc/hexanes eluent) to give the product (4.05 g, 56% overall for the eight steps).  
NMR(CDCl<sub>3</sub>) δ 7.25 (s, 1H), 5.04-5.13 (m, 1H), 3.98 (dd, 1H, J<sub>1</sub>=9.9 Hz, J<sub>2</sub>=8.4 Hz), 3.84 (dd, 1H, J<sub>1</sub>=10.2 Hz, J<sub>2</sub>=4.4 Hz), 3.39 (dt, 1H, J<sub>1</sub>=9.9 Hz, J<sub>2</sub>=4.8 Hz), 3.25 (s, 3H), 3.17 (s, 3H), 2.91 (dt, 1H, J<sub>1</sub>=9.5 Hz, J<sub>2</sub>=4.0 Hz), 2.68 (s, 3H), 2.22-2.6 (m, 2H).

**Part J: (S)-4-(5,7-dibromo-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine** (S)-4-chloro-1-(1-methoxymethyl-3-methoxypropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine (0.72 g, 2.54 mmol) and 5,7-dibromoindoline (0.72 g, 2.60 mmol) were dissolved in anhydrous THF (6 mL) and cooled in an ice bath. To that a 1 M solution of NaHMDS in THF (3.0 mL, 3.0 mmol) was added and the reaction was stirred for 20 min, allowed to warm to 25 °C and stirred for 3 h. Then water (30 mL) was added and the mixture was extracted twice with EtOAc (80 and 40 mL). The combined organic extracts was washed with brine (30 mL) dried (MgSO<sub>4</sub>) and stripped in vacuo. The residue was chromatographed on silica gel using 40% EtOAc/hexanes as eluent to give the product (1.14 g, 85% yield). Elemental analysis. Theory: C 45.73 H 04.41 N 13.33; Found: C 45.99 H 4.25 N 13.37

### Example 2

**Preparation of (R,S)-4-(5,7-dibromo-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine**

**Part A:** (R,S)-2-Aminobutyrolactone hydrobromide (8.0 g, 44 mmol) and triphenylmethyl chloride (12.8 g,

46 mmol) were suspended in dry CH<sub>3</sub>CN (80 mL) at 25 °C. To that Et<sub>3</sub>N (13.6 mL, 100 mmol) was added dropwise, the reaction mixture was stirred at 25 °C for 4 h and partitioned between EtOAc (120 mL) and water (50 mL).

- 5 The organic layer was washed with water (50 mL), brine (50 mL), dried (MgSO<sub>4</sub>) and stripped in vacuo. The residue was recrystallized from EtOAc/hexanes to give 2-triphenylmethylamino-butyrolactone (10.5 g).

- Part B:** Lithium aluminum hydride (1.4 g, 36 mmol) was suspended in dry THF (50 mL) and cooled to 0 °C in an ice bath. To that a solution of 2-triphenylmethylamino-butyrolactone (11 g, 31.9 mmol) in dry THF (70 mL) was added dropwise over a period of 20 min. After the addition was over the reaction mixture was stirred at 0 °C for 1 h, at 25 °C for 3h and quenched by the sequential addition of water (2 mL) 1 N NaOH (2 mL) and water (3 mL), and diluted with ether (150 mL). The precipitated solids were filtered off and the filtrate was concentrated in vacuo to give (R,S)-2-N-triphenylamino-1,4-butanediol. This was used in the same synthetic scheme as previously described for the chiral material (Example 414, Parts C-J) to obtain the racemic material. Elemental analysis. Theory: C 45.73 H 04.41 N 13.33 Br 30.43; Found: C 46.11 H 4.10 N 13.28 Br 30.59.

### Example 3

- Preparation of (R,S)-4-(5,7-dibromo-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine**

- (R, S)-4-chloro-1-(1-methoxymethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine (508 mg, 2.0 mmol) and 5,7-dibromoindoline (554 mg, 2.0 mmol) were dissolved in anhydrous THF (5 mL) and cooled in an ice bath. To that a 1 M solution of NaHMDS in THF (2.0 mL, 2.0 mmol) was added and the reaction was stirred for 20 min,

allowed to warm to 25 °C and stirred for 20 h. An additional 0.6 mL (0.6 mmol) NaHMDS was added and the reaction was stirred for 4 h. Then water (30 mL) was added and the mixture was extracted with EtOAc (100 mL). The organic extract was washed with brine (30 mL) dried (MgSO<sub>4</sub>) and stripped in vacuo. The residue was chromatographed on silica gel using 30% EtOAc/hexanes as eluent to give the product (0.7 g, 79%).

10

**Example 4**

**Preparation of (R,S)-4-(5-bromo-7-methoxy-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine**

(R,S)-4-(5,7-dibromo-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine (0.4 g, 0.9 mmol) was heated to reflux in DMF (5 mL) with NaOMe/MeOH 25% w/w (0.2 mL, ~1 mmol) and CuBr (14.3 mg, 0.1 mmol) for 2 h. Then the reaction mixture was partitioned between EtOAc (100 mL), and water (30 mL). The organic extract was washed with water (30 mL), brine (30 mL), dried (MgSO<sub>4</sub>) and stripped in vacuo. The residue was chromatographed on silica gel using 30% EtOAc/hexanes as eluent to give the product (180 mg, 45%). Elemental analysis. Theory: C 53.82 H 5.429 N 15.69; Found: C 53.73 H 5.14 N 15.54

25

**Example 5**

**Preparation of (R,S)-4-(5-bromo-7-methoxy-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine**

Synthesized under similar conditions described in Example 2. Elemental analysis. Theory: C 52.95 H 05.50 N 14.70 Br 16.77; Found: C 53.28 H 5.52 N 14.63 Br 16.65.

35

**Example 6****Preparation of (R,S)-4-(5-bromo-7-methyl-2,3-dihydro-1H-indolyl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine**

5 (R,S)-4-(5,7-dibromo-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine (0.7141 mmol) was dissolved in anhydrous THF (5 mL) and cooled to -78 °C. A 1.6 M solution of n-butyl lithium was added dropwise, the reaction was  
10 stirred for 5 min and MeI (0.1 mL, 1.61 mmol) was added. The reaction was stirred at -78 °C for 30 min, allowed to warm to 25 °C, quenched with water (30 mL), and extracted with EtOAc (90 mL). The organic extract was washed with brine (30 mL), dried (MgSO<sub>4</sub>) and  
15 stripped in vacuo. The residue was chromatographed on silica gel using 40% EtOAc/hexanes as eluent to give the product (430 mg, 71%). Elemental analysis: Theory: C 55.82 H 05.62 N 16.27 Br 18.57 Found: C 56.09 H 5.39 N 16.27 Br 18.78

20

**Example 7****Preparation of (R,S)-4-(5-bromo-7-formyl-2,3-dihydro-1H-indolyl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine**

25 (R,S)-4-(5,7-dibromo-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine by treatment with nBuLi as described in Example 6 and reaction with DMF. Elemental analysis. Theory: C 53.17 H 5.109 N 14.76 Found C 53.57 H  
30 5.02 N 14.64

**Example 8**

**Preparation of (R,S)-4-(5-bromo-7-hydroxymethyl-2,3-dihydro-1H-indolyl)-1[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine**

(R,S)-4-(5-bromo-7-formyl-2,3-dihydro-1H-indolyl)-1[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine (460 mg, 0.97 mmol) was dissolved in absolute ethanol (10 mL) and cooled in an ice bath. Then NaBH<sub>4</sub> was added (40 mg, 1.0 mmol) and the reaction was stirred at 0 °C for 15 min and at 25 °C for 2 h. The reaction was quenched with 0.3 N NaOH (30 mL) and extracted with EtOAc (100 mL). The organic extract was washed with brine (30 mL), dried (MgSO<sub>4</sub>) and stripped in vacuo. The residue was chromatographed on silica gel using 66% EtOAc/hexanes as eluent to give the product 380 mg, 82%). Elemental analysis. Theory: C 52.95 H 05.50 N 14.70 Found: C 53.14 H 5.45 N 14.39.

**Example 9**

**Preparation of (R,S)-4-(5-bromo-7-methoxymethyl-2,3-dihydro-1H-indolyl)-1[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine**

(R,S)-4-(5-bromo-7-hydroxymethyl-2,3-dihydro-1H-indolyl)-1[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine (220 mg, 0.47 mmol), dissolved in anhydrous THF (4 mL) was treated with NaH 60% in oil (23 mg, 0.56 mmol) at 25 °C for 15 min and MeI (0.035 mL, 0.56 mmol) was added. The reaction was stirred at 25 °C for 16 h and partitioned between EtOAc (90 mL) and water (30 mL). The organic extract was washed with brine (30 mL), dried (MgSO<sub>4</sub>) and stripped in vacuo. The residue was chromatographed on silica gel

using 50% EtOAc/hexanes as eluent to give the product  
190 mg, 85%). Elemental analysis. Theory: C 53.88 H  
5.765 N 14.28 Found: C 54.09 H 5.69 N  
13.95.

5

### Example 10

**Preparation of (R,S)-4-(5-bromo-7-chloro-2,3-dihydro-  
1H-indolyl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-  
1,2,3-triazolo[4,5-c] pyridine**

10

**Part A:** 1-Acetyl-5-bromoindoline (2.47 g, 10.29 mmol)  
was heated at reflux with N-chlorosuccinimide (1.56 g,  
10.40 mmol) in CH<sub>3</sub>CN for 30 min and an additional  
amount NCS (1 g, 7.47 mmol) was added while hot and the  
15 reaction was stirred at 25 °C for 16 h. The solvent was  
stripped in vacuo and the residue was chromatographed  
on silica gel using 20% EtOAc/hexanes as eluent to give  
1-acetyl-5-bromo-7-chloroindoline (1.17 g).

20 **Part B:** 1-acetyl-5-bromo-7-chloroindoline (1.17 g) was  
dissolved in a mixture of ethanol (15 mL) and water (8  
mL) containing KOH (0.5 g) and heated to reflux for 2  
h. The reaction was partitioned between EtOAc (100 mL)  
and water (20 mL). The organic extract was washed with  
25 brine (20 mL), dried and stripped in vacuo to give 5-  
bromo-7-chloroindoline (0.87 g).

**Part C:** 5-bromo-7-chloroindoline (0.465 g) was coupled  
with (R, S)-4-chloro-1-(1-methoxymethylpropyl)-6-  
30 methyl-1H-1,2,3-triazolo[4,5-c]pyridine (0.5 g) using  
NaHMDS as described in Example 3 to give the product  
(0.42 g) after chromatographic purification (30%  
EtOAc/hexanes).

**Example 48****Preparation of (R,S)-4-(5,7-dibromo-2,3-dihydro-1H-indol-1-yl)-1-[1-methoxyethyl]propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c] pyrimidine**

- 5       **Part A:** 4,6-Dihydroxy-2-methylpyrimidine (60 g) was added in portions to fuming nitric acid (120 mL) at 0 °C while cooling the reaction flask. After completion of addition, the reaction was stirred an additional 1 h at 0 °C followed by another 1 h at room temperature.
- 10      The reaction mixture was then poured over ice (200 g) and the ice was allowed to melt. A light pink solid was isolated by filtration and washed with cold water (100 mL). The solid was dried in a vacuum oven overnight to yield 4,6-dihydroxy-2-methyl-5-nitropyrimidine (72.5g).
- 15       **Part B:** The product of Part A was added portionwise to phosphorous oxychloride (400 mL) under a nitrogen atmosphere followed by dropwise addition of N,N-diethylaniline (80 mL). The reaction mixture was
- 20      refluxed for 2 1/2 h with stirring, cooled to room temperature, poured over ice (2.0 Kg) and stirred for 1 hr. The aqueous layer was extracted with diethyl ether (4 x 500 mL) and the extracts combined. The combined extracts were washed with brine (500 mL), dried over
- 25      anhydrous magnesium sulfate, filtered and stripped down to afford 4,6-dichloro-2-methyl-5-nitropyrimidine as a yellow solid (68.8 g) which has an unpleasant odor.
- 30       **Part C:** The product of Part B (42 g) was added to acetic acid (77 mL) and methanol (350 mL). To this mixture was added iron powder (42 g) in portions, stirred for 2 h at 60-65 C, cooled to room temperature, and filtered.
- 35      The filtrate was stripped to a brown solid, which was extracted with ethyl acetate ( 2 x 500 mL), washed with 1N NaOH (250 mL), and brine (500 mL). The organic layer



was dried over anhydrous magnesium sulfate, filtered and stripped down to yield 5-amino-4,6-dichloro-2-methylpyrimidine as a pale yellow solid (25.4 g).

5           **Part D:** The product of Part C (3.6 g) from was dissolved in ethanol (40 mL) and N,N-diisopropylethylamine (3.1 g). To this mixture 2-amino-1-methoxy-butane (3.5 g) was added and refluxed for 7 days. The ethanol was stripped off in vacuum, the  
10 residue was partitioned between ethyl acetate (50 mL) and water (50 mL). The organic layer was stripped down to yield 5-amino-4-chloro-6-(1-methoxy-2-butyl)amino-2-methylpyrimidine as an orange yellow solid (4.7 g; mp 128-130 C).

15           **Part E:** The product of Part D (3.1 g) was dissolved in dichloromethane (25 mL) and 50 % aqueous acetic acid (25 mL). To this stirred mixture was added sodium nitrite (0.92 g) in water (5 mL) dropwise at  
20 room temperature. After completion of addition, the reaction was stirred for an additional 15 min. The organic layer was separated, washed with water, dried with anhydrous magnesium sulfate, and stripped down to a residue. The residue was purified by flash column  
25 chromatography (CH<sub>2</sub>Cl<sub>2</sub>) to afford 7-chloro-3-[1-(1-methoxymethyl)propyl]-5-methyl-3H-1,2,3-triazolo[4,5-d]pyrimidine as a white crystalline solid (3.1 g; 86-87 C). Elemental analysis for C<sub>10</sub>H<sub>14</sub>ClN<sub>5</sub>O: Theory C: 46.97, H: 5.53, N: 27.39. Found: C: 47.22 , H: 5.43,  
30 N: 27.47.

**Part F:** 7-chloro-3-[1-(1-methoxymethyl)propyl]-5-methyl-3H-1,2,3-triazolo[4,5-d]-pyrimidine (210 mg, 0.82 mmol) was heated with 5,7-dibromoindoline (430 mg, 1.55 mmol) at 140 °C for 4 h. The reaction mixture was  
35 dissolved in CH<sub>2</sub>Cl<sub>2</sub> (6 mL), filtered and chromatographed on silica gel using 30% EtOAc/hexanes

as eluent to give the product (0.25 g, 50% yield).  
Elemental analysis. Theory: C 43.57 H 04.06 N  
16.94; Found: C 43.84 H 3.87 N 16.61.

5

**Example 288**

**Preparation of (R,S)-8-Chloro-1,2,3,4-tetrahydro-1-[1-  
[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-  
triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline**

Synthesized by reaction of 8-Chloro-6-methyl-1,2,3,4-  
10 tetrahydroquinoline and 7-chloro-3-[1-(1-  
methoxymethyl)propyl]-5-methyl-3H-1,2,3-triazolo[4,5-  
d]-pyridine in the presence of NaHMDS as described in  
Example 1.

Elemental analysis. Theory: C 63.07 H 06.55 N  
15 17.51; Found: C 62.98 H 6.46 N 17.15.

**Example 400**

**Preparation of N-(5,7-dibromo-2,3-dihydroindol-1-yl)-  
20 3,6-dimethyl-[1-(1-ethylpropyl)]-1H-pyrazolo[3,4-  
d]pyrimidin-4-amine**

**Part A: 3-Pentylhydrazine HCl:** In a 500 mL flask  
was placed 18.56 g (0.215 moles; fw 86.13; bp 102  
25 °C) of 3-pentanone (Aldrich), 14.8 g (0.2 moles;  
fw 74) of acetylhydrazine (Aldrich) and 200 mL of  
absolute ethanol (Aldrich). The reaction mixture  
was refluxed for 18 h and then evaporated to  
dryness to afford 28.0 g of white crystalline  
30 solid. The crude hydrazone was dissolved in 200 ml  
of glacial AcOH (Baker) containing 1.0 g of PtO<sub>2</sub>  
(Aldrich) and hydrogenated at 50 PSI hydrogen  
pressure for 14h. The catalyst from the mixture  
was filtered and evaporated to dryness to afford  
35 37.34 g of colorless viscous oil. The oil was

treated with 100 ml of water and acidified using  
16 ml of con. HCl and extracted the aq. layer with  
200 mL of diethyl ether to remove non basic  
compounds. The aq. layer was adjusted to PH 9  
5 using solid Na<sub>2</sub>CO<sub>3</sub> and extracted with diethyl  
ether (3\*100 mL). The organic extract was  
concentrated to afford to give 20.9 g of  
acetylhydrazine derivative as a colorless oil.  
Acetylhydrazine derivative was dissolved in 100 mL  
10 of 12% aq. HCl (33 mL con. HCl + 67 mL water) and  
refluxed for 3h. The reaction mixture was  
evaporated to dryness to afford 22.4 g of 3-  
pentylhydrazine HCl as a white semi solid. NMR  
(CDCl<sub>3</sub>)  $\delta$  1.0 (t, 6H, 2\*CH<sub>3</sub>), 1.8-2.0 (m, 4H,  
15 2\*CH<sub>2</sub>), 3.4 (m, 1H, CH), 7.95-8.0 (bs, NH<sub>2</sub>) and  
mass spectrum (M+H at 103). Over all yield 80.2  
%.

**Part B: 5-Amino-4-cyano-[1-(1-ethylpropyl)]-3-**  
20 **methylpyrazole:** 11.9 g of 3-pentylhydrazine  
hydrochloride (Part A), 11.7 g of 1-  
ethoxyethylidene malononitrile and 26.0 g of  
triethylamine were dissolved in 100 mL of methanol  
and refluxed for a period of 20h. The solvent was  
25 stripped in vacuo and partitioned the residue with  
100 mL each of water and ethyl acetate and  
extracted the aqueous layer with 2\*50 mL of ethyl  
acetate. The combined organic extracts were washed  
with brine, dried and stripped in vacuo to afford  
30 16.8 g of brown oil. The oil was purified by flash  
column chromatography (1:100 MeOH /  
dichloromethane eluent) to afford 11.7 g (71%) of  
desired pyrazole derivative as a white crystalline  
solid (mp. 117-118 °C). Anal. calcd. for C<sub>10</sub>H<sub>16</sub>N<sub>4</sub>:

C, 62.47; H, 8.40; N, 29.14. Found: C, 62.17; H, 8.39; N, 29.18.

**Part C: 5-Amino-[1-(1-ethylpropyl)]-3-**

5 **methylpyrazole-4-carboxamide:** 8.0 g of the above nitrile (part B) was added to a ice cold stirred solution of concentrated sulfuric acid (20 mL) over 60 mins. After the addition the mixture was stirred at room temperature overnight. The  
10 reaction mixture was poured over 100 g of crushed ice and adjusted PH 8 to 9 using 50% NaOH solution. The mixture was extracted with ethyl acetate (3\*75 mL), washed the organic extract with brine and dried. The solvent was stripped off and  
15 the pasty mass was crystallized from 2-propanol to afford 8.3 g (86% yield) of white crystalline solid (mp. 91-92 °C). Anal. calcd. for C<sub>10</sub>H<sub>18</sub>N<sub>4</sub>O: C, 57.12; H, 8.64; N, 26.64. Found: C, 57.13; H, 8.51; N, 26.42.

20

**Part D: 3,6-Dimethyl-[1-(1-ethyl-propyl)]-4-hydroxy-1H-pyrazolo[3,4-d]pyrimidine:** 7.4 g of Part C material, 17.0 mL of ethyl acetate, 33.8 mL of 21% NaOEt were dissolved in 100 mL of ethanol and refluxed for a  
25 period of 24 h. The solvent from the reaction mixture was stripped off in vacuo and the residue was dissolved in 50 mL of water and acidified with concentrated hydrochloric acid to PH 5 to 6. The cream colored solid separated from the mixture was filtered and dried  
30 to afford 7.65 g of desired product (93.4%; mp. 202-203 °C). Anal. calcd. for C<sub>12</sub>H<sub>18</sub>N<sub>4</sub>O: C, 61.52; H, 7.74; N, 23.91. Found: C, 61.23; H, 7.70; N, 23.62.

**Part E: 4-Chloro-3,6-dimethyl-[1-(1-ethyl-propyl)]-1H-pyrazolo[3,4-d]pyrimidine:** The product of Part D (7.0 g) and 70 mL of phosphorous oxychloride were mixed and refluxed for a period of 6 h. Excess phosphorous oxychloride was stripped off in vacuo and the residue was poured over 50 g of ice. The resultant aqueous layer was extracted with 3\*50 mL of ethyl acetate, washed the organic layer with brine (2\*50 mL) and dried. The solvent was stripped off in vacuo and purified the crude by flash column chromatography (1:100 MeOH / dichloromethane) to afford 5.7 g (75%) of desired product as a cream colored solid (mp. 33-34 °C). Anal. calcd. for C<sub>12</sub>H<sub>17</sub>N<sub>4</sub>Cl: C, 57.03; H, 6.79; N, 22.17. Found: C, 57.12; H, 6.70; N, 22.17.

**Part F: Title Compound:** The product of part E (0.126 g) and 5,7-dibromoindoline (0.277 g) were heated together at 130 °C for 6 h under nitrogen atmosphere. The residue was then subjected to flash column chromatography (1:100 MeOH + dichloromethane) to yield an oil and it was crystallized from diethyl ether to give 0.077 g (31% yield) of desired product as a brown solid (mp. 190-191 °C). Anal. calcd. for C<sub>20</sub>H<sub>23</sub>N<sub>5</sub>Br<sub>2</sub>: C, 48.70; H, 4.70; N, 14.20. Found: C, 49.18; H, 4.72; N, 13.90.

#### Example 500

**Preparation of 4-(5,7-dimethoxy-2,3-dihydro-1H-indol-1-yl)-1-[1-ethylpropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine**

**Part A:** To 5-methoxyindole (5.0 g) in glacial acetic acid (90 mL, 15 - 17°C) was added sodium cyanoborohydride (6.41 g, 3 eq.), and the mixture was stirred 2h. Water (250 mL) was added to the mixture,

which was then cooled in an ice bath and made strongly basic with sodium hydroxide pellets. The solution was extracted with ether, which was then washed with water and brine and dried over  $\text{MgSO}_4$ . The ether solution was  
5 concentrated to give 5-methoxyindoline, which was reacted without further purification.

**Part B:** 5-Methoxyindoline and di-*tert*-butyl dicarbonate (8.95 g, 1.2 eq.) were stirred in THF overnight at room temperature. The solution was  
10 concentrated *in vacuo* and recrystallized from Et<sub>2</sub>O/hexane to give 1-(*tert*-Butoxycarbonyl)-5-methoxyindoline (6.25 g, 74% yield for two steps).

**Part C:** To 1-(*tert*-Butoxycarbonyl)-5-methoxyindoline (2.0 g) and TMEDA (1.57 mL, 1.3 eq.) in  
15 ether (40 mL) at  $-78^\circ\text{C}$  was added *sec*-BuLi (7.4 mL, 1.2 eq.). The reaction was warmed to  $-40^\circ\text{C}$  for 2 hours and then cooled to  $-78^\circ\text{C}$ . 1,2-dibromoethane (2.07 mL, 3 eq.) was added and the reaction stirred for 45 minutes at  $-78^\circ\text{C}$ . The bath was then removed and the reaction  
20 was stirred for 1 hour. The reaction was quenched with water and extracted with ether. The ether was washed with brine, dried over  $\text{MgSO}_4$ , and concentrated. The crude product was chromatographed on silica gel, using hexane/ethyl acetate (19:1) as eluent, affording 1-  
25 (*tert*-butoxycarbonyl)-7-bromo-5-methoxyindoline (1.16 g).

**Part D:** To 1-(*tert*-butoxycarbonyl)-7-bromo-5-methoxyindoline (1.16 g) in methanol (28 mL) was added HCl/ether (1.0 M, 14.1 mL, 4 eq.). The reaction was  
30 heated at  $55^\circ\text{C}$  for 4 hours and then cooled to room temperature. Water (25 mL) was added and the pH was adjusted to 9 with NaOH (1 N, aq.). The mixture was extracted with ether, which was washed with brine, dried

over MgSO<sub>4</sub>, and concentrated to give 7-bromo-5-methoxyindoline (685 mg).

**Part E:** To 7-bromo-5-methoxyindoline (382mg) and 4-chloro-1-[1-ethylpropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine (400 mg) in THF (2.0 mL) was added sodium bis(trimethylsilyl)amide (1.0 M in THF, 15mL) at 0°C. The reaction was warmed to ambient temperature and stirred for 1 hour. Ethyl acetate (150 mL) was added and washed with water and brine. The organics were dried over MgSO<sub>4</sub> and concentrated. The crude product was chromatographed on silica gel using ethyl acetate/hexane (1:4) as eluent to give 4-(7-bromo-5-methoxy-2,3-dihydro-1H-indol-1-yl)-1-[1-ethylpropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine (538 mg).

**Part F:** To the product of part E (200 mg) in DMF (2.5 mL) was added cuprous bromide (7 mg) and sodium methoxide (25% w/w solution in methanol, 117 mL). The mixture was heated at reflux for 5 hours. The reaction was cooled and partitioned between ethyl acetate and water. The organic layer was washed with brine, dried over MgSO<sub>4</sub>, and concentrated to give the title compound (128 mg). MS (NH<sub>3</sub>-CI) *m/z* 382 (M+H)<sup>+</sup>.

25

#### Example 501

**Preparation of (R,S)-4-(5,7-dichloro-2,3-dihydro-1H-indol-1-yl)-1-[1-(cyanomethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine**

30

The title compound was prepared in a manner similar to the product of Example 500. Elemental analysis calcd. for C<sub>19</sub>H<sub>18</sub>N<sub>6</sub>Cl<sub>2</sub>: C, 56.87; H, 4.52; N, 20.94. Found: C, 56.50; H, 4.34; N, 20.58.

35

#### Example 502

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Preparation of (S)-4-(7-chloro-5-methoxy-2,3-dihydro-  
1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-  
1,2,3-triazolo[4,5-c]pyridine

- 5        The title compound was prepared in a manner  
similar to the product of Example 500.

10



UtilityCRF-R1 Receptor Binding Assay for the Evaluation of  
Biological Activity

5

The following is a description of the isolation of cell membranes containing cloned human CRF-R1 receptors for use in the standard binding assay as well as a description of the assay itself.

10 Messenger RNA was isolated from human hippocampus. The mRNA was reverse transcribed using oligo (dt) 12-18 and the coding region was amplified by PCR from start to stop codons. The resulting PCR fragment was cloned into the EcoRV site of pGEMV, from whence the insert  
15 was reclaimed using XhoI + XbaI and cloned into the XhoI + XbaI sites of vector pm3ar ( which contains a CMV promoter, the SV40 't' splice and early poly A signals, an Epstein-Barr viral origin of replication, and a hygromycin selectable marker). The resulting  
20 expression vector, called phchCRFR was transfected in 293EBNA cells and cells retaining the episome were selected in the presence of 400  $\mu$ M hygromycin. Cells surviving 4 weeks of selection in hygromycin were pooled, adapted to growth in suspension and used to  
25 generate membranes for the binding assay described below. Individual aliquots containing approximately  $1 \times 10^8$  of the suspended cells were then centrifuged to form a pellet and frozen.

For the binding assay a frozen pellet described  
30 above containing 293EBNA cells transfected with hCRFR1 receptors is homogenized in 10 ml of ice cold tissue buffer ( 50 mM HEPES buffer pH 7.0, containing 10 mM MgCl<sub>2</sub>, 2 mM EGTA, 1  $\mu$ g/l aprotinin, 1  $\mu$ g/ml leupeptin and 1  $\mu$ g/ml pepstatin). The homogenate is centrifuged  
35 at 40,000 x g for 12 min and the resulting pellet rehomogenized in 10 ml of tissue buffer. After another centrifugation at 40,000 x g for 12 min, the pellet is

resuspended to a protein concentration of 360 µg/ml to be used in the assay.

Binding assays are performed in 96 well plates; each well having a 300 µl capacity. To each well is added 50 µl of test drug dilutions (final concentration of drugs range from  $10^{-10}$  -  $10^{-5}$  M), 100 µl of  $^{125}\text{I}$ -ovine-CRF ( $^{125}\text{I}$ -o-CRF) (final concentration 150 pM) and 150 µl of the cell homogenate described above. Plates are then allowed to incubate at room temperature for 2 hours before filtering the incubate over GF/F filters (presoaked with 0.3% polyethyleneimine) using an appropriate cell harvester. Filters are rinsed 2 times with ice cold assay buffer before removing individual filters and assessing them for radioactivity on a gamma counter.

Curves of the inhibition of  $^{125}\text{I}$ -o-CRF binding to cell membranes at various dilutions of test drug are analyzed by the iterative curve fitting program LIGAND [P.J. Munson and D. Rodbard, *Anal. Biochem.* 107:220 (1980)], which provides  $K_i$  values for inhibition which are then used to assess biological activity.

A compound is considered to be active if it has a  $K_i$  value of less than about 10000 nM for the inhibition of CRF.

#### Inhibition of CRF-Stimulated Adenylate Cyclase Activity

Inhibition of CRF-stimulated adenylate cyclase activity can be performed as described by G. Battaglia et al. *Synapse* 1:572 (1987). Briefly, assays are carried out at 37° C for 10 min in 200 ml of buffer containing 100 mM Tris-HCl (pH 7.4 at 37° C), 10 mM  $\text{MgCl}_2$ , 0.4 mM EGTA, 0.1% BSA, 1 mM isobutylmethylxanthine (IBMX), 250 units/ml phosphocreatine kinase, 5 mM creatine phosphate, 100 mM guanosine 5'-triphosphate, 100 nM oCRF, antagonist peptides (concentration range  $10^{-9}$  to  $10^{-$

6m) and 0.8 mg original wet weight tissue (approximately 40-60 mg protein). Reactions are initiated by the addition of 1 mM ATP/<sup>32</sup>P]ATP (approximately 2-4 mCi/tube) and terminated by the addition of 100 ml of 50 mM Tris-HCL, 45 mM ATP and 2% sodium dodecyl sulfate. In order to monitor the recovery of cAMP, 1 µl of [<sup>3</sup>H]cAMP (approximately 40,000 dpm) is added to each tube prior to separation. The separation of [<sup>32</sup>P]cAMP from [<sup>32</sup>P]ATP is performed by sequential elution over Dowex and alumina columns.

#### In vivo Biological Assay

The in vivo activity of the compounds of the present invention can be assessed using any one of the biological assays available and accepted within the art. Illustrative of these tests include the Acoustic Startle Assay, the Stair Climbing Test, and the Chronic Administration Assay. These and other models useful for the testing of compounds of the present invention have been outlined in C.W. Berridge and A.J. Dunn *Brain Research Reviews* 15:71 (1990).

Compounds may be tested in any species of rodent or small mammal.

Compounds of this invention have utility in the treatment of imbalances associated with abnormal levels of corticotropin releasing factor in patients suffering from depression, affective disorders, and/or anxiety.

Compounds of this invention can be administered to treat these abnormalities by means that produce contact of the active agent with the agent's site of action in the body of a mammal. The compounds can be administered by any conventional means available for use in conjunction with pharmaceuticals either as

individual therapeutic agent or in combination of therapeutic agents. They can be administered alone, but will generally be administered with a pharmaceutical carrier selected on the basis of the chosen route of administration and standard pharmaceutical practice.

The dosage administered will vary depending on the use and known factors such as pharmacodynamic character of the particular agent, and its mode and route of administration; the recipient's age, weight, and health; nature and extent of symptoms; kind of concurrent treatment; frequency of treatment; and desired effect. For use in the treatment of said diseases or conditions, the compounds of this invention can be orally administered daily at a dosage of the active ingredient of 0.002 to 200 mg/kg of body weight. Ordinarily, a dose of 0.01 to 10 mg/kg in divided doses one to four times a day, or in sustained release formulation will be effective in obtaining the desired pharmacological effect.

Dosage forms (compositions) suitable for administration contain from about 1 mg to about 100 mg of active ingredient per unit. In these pharmaceutical compositions, the active ingredient will ordinarily be present in an amount of about 0.5 to 95% by weight based on the total weight of the composition.

The active ingredient can be administered orally in solid dosage forms, such as capsules, tablets and powders; or in liquid forms such as elixirs, syrups, and/or suspensions. The compounds of this invention can also be administered parenterally in sterile liquid dose formulations.

Gelatin capsules can be used to contain the active ingredient and a suitable carrier such as but

not limited to lactose, starch, magnesium stearate, steric acid, or cellulose derivatives. Similar diluents can be used to make compressed tablets. Both tablets and capsules can be manufactured as  
5 sustained release products to provide for continuous release of medication over a period of time. Compressed tablets can be sugar-coated or film-coated to mask any unpleasant taste, or used to protect the active ingredients from the atmosphere,  
10 or to allow selective disintegration of the tablet in the gastrointestinal tract.

Liquid dose forms for oral administration can contain coloring or flavoring agents to increase patient acceptance.

15 In general, water, pharmaceutically acceptable oils, saline, aqueous dextrose (glucose), and related sugar solutions and glycols, such as propylene glycol or polyethylene glycol, are suitable carriers for parenteral solutions.  
20 Solutions for parenteral administration preferably contain a water soluble salt of the active ingredient, suitable stabilizing agents, and if necessary, buffer substances. Antioxidizing agents, such as sodium bisulfite, sodium sulfite, or  
25 ascorbic acid, either alone or in combination, are suitable stabilizing agents. Also used are citric acid and its salts, and EDTA. In addition, parenteral solutions can contain preservatives such as benzalkonium chloride, methyl- or propyl-paraben,  
30 and chlorobutanol.

Suitable pharmaceutical carriers are described in "Remington's Pharmaceutical Sciences", A. Osol, a standard reference in the field.

Useful pharmaceutical dosage-forms for  
35 administration of the compounds of this invention can be illustrated as follows:

### Capsules

A large number of units capsules are prepared by filling standard two-piece hard gelatin capsules each with 100 mg of powdered active ingredient, 150  
5 mg lactose, 50 mg cellulose, and 6 mg magnesium stearate.

### Soft Gelatin Capsules

A mixture of active ingredient in a digestible  
10 oil such as soybean, cottonseed oil, or olive oil is prepared and injected by means of a positive displacement was pumped into gelatin to form soft gelatin capsules containing 100 mg of the active  
ingredient. The capsules were washed and dried.

15

### Tablets

A large number of tablets are prepared by conventional procedures so that the dosage unit was 100 mg active ingredient, 0.2 mg of colloidal  
20 silicon dioxide, 5 mg of magnesium stearate, 275 mg of microcrystalline cellulose, 11 mg of starch, and 98.8 mg lactose. Appropriate coatings may be applied to increase palatability or delayed  
adsorption.

25

The compounds of this invention may also be used as reagents or standards in the biochemical study of neurological function, dysfunction, and  
disease.

30

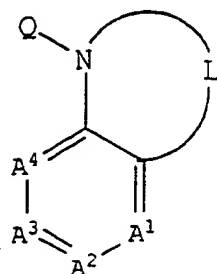
Although the present invention has been described and exemplified in terms of certain preferred embodiments, other embodiments will be apparent to those skilled in the art. The invention  
35 is, therefore, not limited to the particular embodiments described and exemplified, but is capable of modification or variation without

departing from the spirit of the invention, the full scope of which is delineated by the appended claims.

CLAIMS

WHAT IS CLAIMED IS:

- 5 1. A compound of Formula (I)

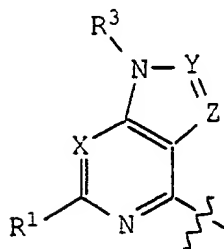
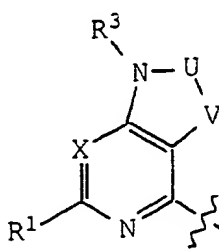
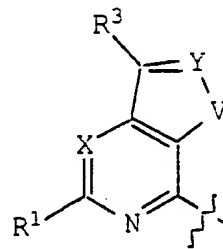
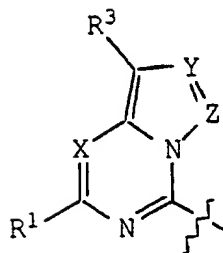
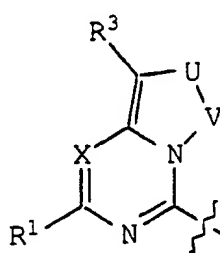
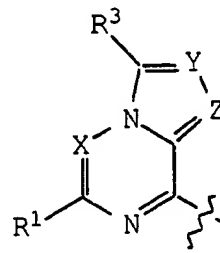


(I)

10

and isomers thereof, stereoisomeric forms thereof, or mixtures of stereoisomeric forms thereof, and pharmaceutically acceptable salt forms thereof wherein:

- 15 Q is selected from the group consisting of:

**Ia****Ib****Ic****IIa****IIb****IIc**



X is N or CR<sup>1</sup>;

Y, Z are independently N or CR<sup>2</sup>;

5

U, V are independently >C=G, CR<sup>13</sup>R<sup>14</sup>, or NR<sup>13</sup>, O, or S without forming O-O, S-O, or S-S bonds;

G is O or S;

10

R<sup>1</sup> is independently at each occurrence -H, halogen, -CN, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>COR<sup>9</sup>, -COR<sup>10</sup>, -OR<sup>10</sup>, SH or -S(O)<sub>n</sub>R<sup>12</sup>, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, where each C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl is each optionally substituted with halogen, -CN, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>COR<sup>9</sup>, -COR<sup>10</sup>, -OR<sup>10</sup>, SH or -S(O)<sub>n</sub>R<sup>12</sup>;

15

20

R<sup>2</sup> is -H, halogen, -CN, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>COR<sup>9</sup>, -COR<sup>10</sup>, -OR<sup>10</sup>, SH or -S(O)<sub>n</sub>R<sup>12</sup>, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>3</sub>-C<sub>7</sub> cycloalkylalkyl, each optionally substituted with halogen, CN, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NR<sup>9</sup>R<sup>10</sup>, NR<sup>9</sup>COR<sup>9</sup>, -COR<sup>10</sup>, -OR<sup>10</sup>, SH or -S(O)<sub>n</sub>R<sup>12</sup>;

25

R<sup>3</sup> is C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>8</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>10</sub> alkoxyalkyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenylalkyl, where one carbon in any cycloalkyl ring may be replaced with O, S or NR<sup>9</sup> and each C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>8</sub> alkynyl, C<sub>3</sub>-C<sub>8</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>10</sub> alkoxyalkyl,

30

35

C<sub>5</sub>-C<sub>10</sub> cycloalkenyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenylalkyl-  
is optionally substituted with 1 to 3  
substituents independently selected at each  
occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-  
5 C<sub>10</sub> alkynyl,  
C<sub>3</sub>-C<sub>6</sub> cycloalkyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl,  
cyano, -OR<sup>7</sup>, SH, -S(O)<sub>n</sub>R<sup>11</sup>, -COR<sup>6</sup>, -NHR<sup>6</sup>SO<sub>2</sub>R<sup>8</sup>,  
-OC(O)NR<sup>6</sup>R<sup>7</sup>, -N<sub>3</sub>, -OC(O)OR<sup>7</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>6</sup>,  
-NR<sup>7</sup>COR<sup>6</sup>, -N(COR<sup>6</sup>)<sub>2</sub>, -NR<sup>7</sup>CONR<sup>6</sup>R<sup>7</sup>, -NR<sup>7</sup>CO<sub>2</sub>R<sup>8</sup>,  
10 -NR<sup>6</sup>R<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>H, aryl, heteroaryl and  
heterocyclyl  
or  
-OR<sup>3a</sup>, -NR<sup>3a</sup>R<sup>3b</sup>, -NHR<sup>3a</sup>, -SO<sub>n</sub>R<sup>3a</sup>, -SO<sub>2</sub>NHR<sup>3a</sup>,  
-SO<sub>2</sub>NR<sup>3a</sup>R<sup>3b</sup>, -COR<sup>3a</sup>, -CONHR<sup>3a</sup>, -CONR<sup>3a</sup>R<sup>3b</sup>;  
15 R<sup>3a</sup> and R<sup>3b</sup> are C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl,  
C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>8</sub> cycloalkyl,  
C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>10</sub> alkoxyalkyl,  
C<sub>5</sub>-C<sub>10</sub> cycloalkenyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenylalkyl,  
20 where one carbon in any cycloalkyl may be  
replaced with O, S or NR<sup>9</sup> and each C<sub>1</sub>-  
C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl,  
C<sub>3</sub>-C<sub>8</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, C<sub>2</sub>-  
C<sub>10</sub> alkoxyalkyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenyl, C<sub>5</sub>-C<sub>10</sub>  
25 cycloalkenylalkyl is optionally substituted  
with 1 to 3 substituents independently selected  
at each occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>2</sub>-C<sub>6</sub>  
alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl,  
halogen,  
30 C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>7</sup>, -SH, -S(O)<sub>n</sub>R<sup>11</sup>,  
-COR<sup>6</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>6</sup>, -NR<sup>7</sup>COR<sup>6</sup>, -N(COR<sup>6</sup>)<sub>2</sub>,  
-NR<sup>7</sup>CONR<sup>6</sup>R<sup>7</sup>, -NR<sup>7</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>6</sup>R<sup>7</sup>, -NHR<sup>6</sup>SO<sub>2</sub>R<sup>8</sup>,  
-OC(O)NR<sup>6</sup>R<sup>7</sup>, -N<sub>3</sub>, -OC(O)OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>H,  
aryl, heteroaryl and heterocyclyl;  
35 L is a two to four atom saturated or partially  
unsaturated linker group optionally containing one

to two B groups and in which one to two carbons of L may be  $>C=O$  or  $>C=S$ , where L may be substituted with one to three  $R^4$  groups;

5  $R^4$  is independently selected in each occurrence -H, -OR<sup>10</sup>, -COR<sup>9</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CONR<sup>9</sup>R<sup>10</sup>, -CN, -NR<sup>9</sup>R<sup>10</sup>, -S(O)<sub>n</sub>R<sup>12</sup>, halogen, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, aryl or heteroaryl, wherein C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, are optionally substituted with the following functional groups: -OR<sup>10</sup>, -COR<sup>9</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CONR<sup>9</sup>R<sup>10</sup>, -CN, -NR<sup>9</sup>R<sup>10</sup>, -S(O)<sub>n</sub>R<sup>12</sup>, halogen;

15 B is O, S(O)<sub>n</sub> or NR<sup>9</sup>;

A<sup>1</sup>-A<sup>4</sup> are independently CR<sup>5</sup>, or up to two of A<sup>1</sup>-A<sup>4</sup> can be N;

20  $R^5$  is independently at each occurrence -H, C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>1</sub>-C<sub>4</sub> haloalkoxy, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, -NO<sub>2</sub>, halogen, -CN, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>COR<sup>7</sup>, -NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup>-OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO(NOR<sup>9</sup>)R<sup>11</sup>, -CO<sub>2</sub>R<sup>8</sup>, or -S(O)<sub>n</sub>R<sup>11</sup>, where C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl and C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl are optionally substituted with 1 to 3 substituents independently selected at each occurrence from C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>2</sub>-C<sub>4</sub> alkenyl, C<sub>2</sub>-C<sub>4</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NO<sub>2</sub>, halogen, -CN, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>COR<sup>7</sup>, NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup>-OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CO(NOR<sup>9</sup>)R<sup>7</sup>, or -S(O)<sub>n</sub>R<sup>11</sup> and wherein two adjacent  $R^5$  groups can form a 5-7 membered ring

saturated on unsaturated optionally containing  
1-2 O or SO<sub>n</sub> or 1-3 N heteroatoms optionally  
substituted with C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl,  
C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl,  
5 C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NO<sub>2</sub>,  
halogen, -CN, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>COR<sup>7</sup>, -NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup>  
-OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CO(NOR<sup>9</sup>)R<sup>7</sup>, or  
-S(O)<sub>n</sub>R<sup>11</sup> and not containing any S-S, O-O, S-O  
or N-S bonds in the ring;

10

R<sup>6</sup> and R<sup>7</sup> are independently at each occurrence H,  
C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>2</sub>-C<sub>8</sub>  
alkoxyalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-  
C<sub>12</sub> cycloalkylalkyl, C<sub>5</sub>-C<sub>12</sub> bis(alkoxy)alkyl,  
15 aryl, aryl(C<sub>1</sub>-C<sub>4</sub> alkyl)-, heteroaryl or  
heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl)

or

NR<sup>6</sup>R<sup>7</sup> is piperidine, pyrrolidine, piperazine,  
N-methylpiperazine, morpholine or  
20 thiomorpholine;

R<sup>8</sup> is independently at each occurrence C<sub>1</sub>-C<sub>4</sub> alkyl,  
C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl,  
C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub>  
25 alkyl), heteroaryl or heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl);

R<sup>9</sup> and R<sup>10</sup> are independently at each occurrence  
selected from H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl,  
C<sub>3</sub>-C<sub>6</sub> alkenyl, C<sub>3</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl,  
30 C<sub>2</sub>-C<sub>6</sub> alkoxyalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl;

R<sup>11</sup> is independently at each occurrence C<sub>1</sub>-C<sub>4</sub> alkyl,  
C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl,  
C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub>  
35 alkyl), heteroaryl, heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl), or  
-NR<sup>6</sup>R<sup>7</sup>;

R<sup>12</sup> is independently at each occurrence C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> alkenyl, C<sub>3</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl;

5 R<sup>13</sup> and R<sup>14</sup>, are independently at each occurrence H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub> alkyl), heteroaryl or heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl)-, -COR<sup>12</sup>,  
10 -CO<sub>2</sub>R<sup>8</sup>, -CONR<sup>9</sup>, S(O)<sub>n</sub>R<sup>12</sup>;

aryl is phenyl or naphthyl, each optionally substituted with 1 to 3 substituents independently selected at each occurrence from  
15 C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>10</sup>, -SH, -S(O)<sub>n</sub>R<sup>12</sup>, -COR<sup>12</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>12</sup>, -NR<sup>9</sup>COR<sup>9</sup>, -N(COR<sup>12</sup>)<sub>2</sub>, -NR<sup>9</sup>CONR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>9</sup>R<sup>10</sup>,  
20 and -CONR<sup>9</sup>R<sup>10</sup>;

heteroaryl is pyridyl, pyrimidinyl, pyrazinyl, pyridazinyl, triazinyl, furanyl, quinolinyl, isoquinolinyl, thienyl, imidazolyl, thiazolyl,  
25 indolyl, pyrrolyl, oxazolyl, benzofuranyl, benzothienyl, benzthiazolyl, isoxazolyl, pyrazolyl, triazolyl, tetrazolyl, or indazolyl, each optionally substituted with 1 to 3 substituents independently selected at each occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>10</sup>, -SH, -S(O)<sub>n</sub>R<sup>12</sup>, -COR<sup>12</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>12</sup>, -NR<sup>9</sup>COR<sup>9</sup>, -N(COR<sup>12</sup>)<sub>2</sub>, -NR<sup>9</sup>CONR<sup>9</sup>R<sup>10</sup>,  
30 -NR<sup>9</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>9</sup>R<sup>10</sup>, and -CONR<sup>9</sup>R<sup>10</sup>;  
35

heterocyclyl is saturated or partially saturated -  
heteroaryl, optionally substituted with 1 to 3  
substituents independently selected at each  
occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl,  
5 C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub>  
alkynyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -  
OR<sup>10</sup>, SH, -S(O)<sub>n</sub>R<sup>12</sup>, -COR<sup>12</sup>, -CO<sub>2</sub>R<sup>12</sup>, -  
OC(O)R<sup>12</sup>,  
-NR<sup>9</sup>COR<sup>9</sup>, -N(COR<sup>12</sup>)<sub>2</sub>, -NR<sup>9</sup>CONR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>CO<sub>2</sub>R<sup>12</sup>,  
10 -NR<sup>9</sup>R<sup>10</sup>, and -CONR<sup>9</sup>R<sup>10</sup>;

n is independently at each occurrence 0, 1 or 2

provided that:

- 15 (a) when Q is I<sub>a</sub>, I<sub>b</sub> or I<sub>c</sub> and X is N, R<sup>1</sup> is not  
H; and  
(b) R<sup>1</sup> is other than O-alkynyl or S-alkynyl;

2. A compound of claim 1 and isomers thereof,  
20 stereoisomeric forms thereof, or mixtures of  
stereoisomeric forms thereof, and pharmaceutically  
acceptable salt forms thereof wherein, independently or  
concurrently:

25 Q is I<sub>a</sub>, I<sub>b</sub>, I<sub>c</sub>;

X is N or CR<sup>1</sup>;

Y, Z are independently N or CR<sup>2</sup>;

30

U, V are >C=G, CR<sup>13</sup>R<sup>14</sup>, or NR<sup>13</sup>, O, or S without  
forming O-O, S-O, or S-S bonds;

G is O;

35

$R^1$  is independently at each occurrence H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, halogen, -CN, -NR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>COR<sup>10</sup>, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -COR<sup>10</sup>, -OR<sup>10</sup> or -S(O)<sub>n</sub>R<sup>12</sup>;

5  $R^2$  is independently at each occurrence -H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, halogen, -CN, -NR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>COR<sup>10</sup>, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -COR<sup>10</sup>, -OR<sup>10</sup> or -S(O)<sub>n</sub>R<sup>12</sup>;

10  $R^3$  is C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>8</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>10</sub> alkoxyalkyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenylalkyl, where one carbon in any cycloalkyl may be replaced with O, S or NR<sup>9</sup> and each C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl,  
 15 C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>8</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>10</sub> alkoxyalkyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenylalkyl is optionally substituted with 1 to 3 substituents independently selected at each  
 20 occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, halo, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>7</sup>, SH, -S(O)<sub>n</sub>R<sup>11</sup>, -COR<sup>6</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>6</sup>, -NR<sup>7</sup>COR<sup>6</sup>, -N(COR<sup>6</sup>)<sub>2</sub>, -NR<sup>7</sup>CONR<sup>6</sup>R<sup>7</sup>, -NR<sup>7</sup>CO<sub>2</sub>R<sup>8</sup>,  
 25 -NR<sup>6</sup>R<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -NHR<sup>6</sup>SO<sub>2</sub>R<sup>8</sup>, -OC(O)NR<sup>6</sup>R<sup>7</sup>, -N<sub>3</sub>, -OC(O)OR<sup>7</sup>, -CO<sub>2</sub>H, aryl, heteroaryl and heterocyclyl;

30 L is a linker selected from the group consisting of: CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup>=CR<sup>4</sup>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>, CR<sup>4</sup>=CR<sup>4</sup>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>B, CR<sup>4</sup>=CR<sup>4</sup>B;

35  $R^4$  is independently selected in each occurrence -H, -OR<sup>10</sup>, -COR<sup>9</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CONR<sup>9</sup>R<sup>10</sup>, -CN, -NR<sup>9</sup>R<sup>10</sup>, -S(O)<sub>n</sub>R<sup>12</sup>, halogen, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, aryl or heteroaryl, each optionally substituted

with the following functional groups:  $-OR^{10}$ ,  $-COR^3$ ,  
 $CO_2R^8$ ,  
 $-CONR^9R^{10}$ ,  $-CN$ ,  $-NR^9R^{10}$ ,  $-S(O)_nR^{12}$ , halogen, or two  
 $R^4$  taken together form one or two carbonyl(s) or  
 5 thiocarbonyl(s);

B is O,  $S(O)_n$ ,  $NR^{12}$ ;

$A^1-A^4$  are  $CR^5$ ;

10

$R^5$  is independently at each occurrence -H,  
 $C_1-C_{10}$  alkyl,  $C_1-C_4$  haloalkyl,  $C_1-C_4$   
 haloalkoxy,  $C_2-C_{10}$  alkenyl,  $C_2-C_{10}$  alkynyl,  $C_3-$   
 $C_6$  cycloalkyl,  $C_4-C_{12}$  cycloalkylalkyl,  $-NO_2$ ,  
 15 halogen,  $-CN$ ,  $-NR^6R^7$ ,  $-NR^6COR^7$ ,  $-NR^6CO_2R^8$ ,  $-COR^6$   
 $-OR^7$ ,  $-CONR^6R^7$ ,  $-CO(NOR^9)R^{11}$ ,  $-CO_2R^8$ , or  
 $-S(O)_nR^{11}$ , where  $C_1-C_{10}$  alkyl,  $C_2-C_{10}$  alkenyl,  
 $C_2-C_{10}$  alkynyl,  $C_3-C_6$  cycloalkyl and  
 $C_4-C_{12}$  cycloalkylalkyl are optionally  
 20 substituted with 1 to 3 substituents  
 independently selected at each occurrence from  
 $C_1-C_4$  alkyl,  $C_2-C_4$  alkenyl,  $C_2-C_4$  alkynyl,  $C_3-$   
 $C_6$  cycloalkyl,  $C_4-C_8$  cycloalkylalkyl,  $C_1-C_4$   
 haloalkyl,  $-NO_2$ , halogen,  $-CN$ ,  $-NR^6R^7$ , -  
 25  $NR^6COR^7$ ,  $NR^6CO_2R^8$ ,  $-COR^6$   $-OR^7$ ,  $-CONR^6R^7$ ,  $-CO_2R^8$ ,  
 $-CO(NOR^9)R^7$ , or  $-S(O)_nR^{11}$  and wherein two  
 adjacent  $R^5$  groups can form a 5-7 membered ring  
 saturated on unsaturated optionally containing  
 1-2 O or  $SO_n$  or 1-3 N heteroatoms optionally  
 30 substituted with  $C_1-C_4$  alkyl,  $C_2-C_6$  alkenyl,  
 $C_2-C_6$  alkynyl,  $C_3-C_6$  cycloalkyl,  
 $C_4-C_8$  cycloalkylalkyl,  $C_1-C_4$  haloalkyl,  $-NO_2$ ,  
 halogen,  $-CN$ ,  $-NR^6R^7$ ,  $NR^6COR^7$ ,  $NR^6CO_2R^8$ ,  $-COR^6$   
 $-OR^7$ ,  $-CONR^6R^7$ ,  $-CO_2R^8$ ,  $-CO(NOR^9)R^7$ , or  
 35  $-S(O)_nR^{11}$  and not containing any S-S, O-O, S-O  
 or N-S bonds in the ring;



- R<sup>6</sup> and R<sup>7</sup> are independently at each occurrence H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>2</sub>-C<sub>8</sub> alkoxyalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub> alkyl)-, heteroaryl or heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl)-; or NR<sup>6</sup>R<sup>7</sup> is piperidine, pyrrolidine, piperazine, N-methylpiperazine, morpholine or thiomorpholine;
- R<sup>8</sup> is independently at each occurrence C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub> alkyl), heteroaryl or heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl);
- R<sup>9</sup> and R<sup>10</sup> are independently at each occurrence selected from H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> alkenyl, C<sub>3</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl;
- R<sup>11</sup> is C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>2</sub>-C<sub>8</sub> alkoxyalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub> alkyl), heteroaryl or heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl), piperidine, pyrrolidine, piperazine, N-methylpiperazine, morpholine or thiomorpholine;
- R<sup>12</sup> is C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> alkenyl, C<sub>3</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl;
- R<sup>13</sup> and R<sup>14</sup> are independently H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub> alkyl), heteroaryl or heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl)-, -COR<sup>12</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CONR<sup>9</sup>, -S(O)<sub>n</sub>R<sup>12</sup>;

aryl is phenyl or naphthyl, each optionally substituted with 1 to 3 substituents independently selected at each occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>10</sup>, SH, -S(O)<sub>n</sub>R<sup>12</sup>, -COR<sup>12</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>12</sup>, -NR<sup>9</sup>COR<sup>9</sup>, -N(COR<sup>12</sup>)<sub>2</sub>, -NR<sup>9</sup>CONR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>9</sup>R<sup>10</sup>, and -CONR<sup>9</sup>R<sup>10</sup>;

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heteroaryl is pyridyl, pyrimidinyl, pyrazinyl, pyridazinyl, triazinyl, furanyl, quinolinyl, isoquinolinyl, thienyl, imidazolyl, thiazolyl, indolyl, pyrrolyl, oxazolyl, benzofuranyl, benzothienyl, benzthiazolyl, isoxazolyl, pyrazolyl, triazolyl, tetrazolyl, or indazolyl, each optionally substituted with 1 to 3 substituents independently selected at each occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>10</sup>, SH, -S(O)<sub>n</sub>R<sup>12</sup>, -COR<sup>12</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>12</sup>, -NR<sup>9</sup>COR<sup>9</sup>, -N(COR<sup>12</sup>)<sub>2</sub>, -NR<sup>9</sup>CONR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>9</sup>R<sup>10</sup>, and -CONR<sup>9</sup>R<sup>10</sup>;

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heterocyclyl is saturated or partially saturated heteroaryl, optionally substituted with 1 to 3 substituents independently selected at each occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>10</sup>, SH, -S(O)<sub>n</sub>R<sup>12</sup>, -COR<sup>12</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>12</sup>, -NR<sup>9</sup>COR<sup>9</sup>, -N(COR<sup>12</sup>)<sub>2</sub>, -NR<sup>9</sup>CONR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>9</sup>R<sup>10</sup>, and -CONR<sup>9</sup>R<sup>10</sup>;

30

35

n is independently at each occurrence 0, 1 or 2;

3. A compound of claim 1 and isomers thereof,  
stereoisomeric forms thereof, or mixtures of  
stereoisomeric forms thereof, and pharmaceutically  
5 acceptable salt forms thereof wherein, independently or  
concurrently:

Q is IIa, IIb, or IIc;

10 X is N or CR<sup>1</sup>;

Y, Z are independently N or CR<sup>2</sup>;

15 U, V are >C=G, CR<sup>13</sup>R<sup>14</sup>, or NR<sup>13</sup>, O, or S without  
forming O-O, S-O, or S-S bonds;

G is O;

20 R<sup>1</sup> is independently at each occurrence H, C<sub>1</sub>-C<sub>4</sub> alkyl,  
C<sub>3</sub>-C<sub>6</sub> cycloalkyl, halogen, -CN, -NR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>COR<sup>10</sup>,  
C<sub>1</sub>-C<sub>4</sub> haloalkyl, -COR<sup>10</sup>, -OR<sup>10</sup> or -S(O)<sub>n</sub>R<sup>12</sup>;

25 R<sup>2</sup> is independently at each occurrence H, C<sub>1</sub>-C<sub>4</sub> alkyl,  
C<sub>3</sub>-C<sub>6</sub> cycloalkyl, halogen, -CN, -NR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>COR<sup>10</sup>,  
C<sub>1</sub>-C<sub>4</sub> haloalkyl, -COR<sup>10</sup>, -OR<sup>10</sup> or -S(O)<sub>n</sub>R<sup>12</sup>;

30 R<sup>3</sup> is C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl,  
C<sub>3</sub>-C<sub>8</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, C<sub>2</sub>-  
C<sub>10</sub> alkoxyalkyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenyl, C<sub>5</sub>-C<sub>10</sub>  
cycloalkenylalkyl, where one carbon in any  
cycloalkyl may be replaced with O, S or NR<sup>9</sup> and  
each C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl,  
C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>8</sub> cycloalkyl,  
C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>10</sub> alkoxyalkyl,  
35 C<sub>5</sub>-C<sub>10</sub> cycloalkenyl, C<sub>5</sub>-C<sub>10</sub> cycloalkenylalkyl  
is optionally substituted with 1 to 3  
substituents independently selected at each

occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>7</sup>, SH, -S(O)<sub>n</sub>R<sup>11</sup>, -COR<sup>6</sup>, -CO<sub>2</sub>R<sup>8</sup>,  
 5 -OC(O)R<sup>6</sup>, -NR<sup>7</sup>COR<sup>6</sup>, -N(COR<sup>6</sup>)<sub>2</sub>, -NR<sup>7</sup>CONR<sup>6</sup>R<sup>7</sup>, -NR<sup>7</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>6</sup>R<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -NHR<sup>6</sup>SO<sub>2</sub>R<sup>8</sup>, -OC(O)NR<sup>6</sup>R<sup>7</sup>, -N<sub>3</sub>, -OC(O)OR<sup>7</sup>, -CO<sub>2</sub>H, aryl, heteroaryl and heterocyclyl;

10 L is a linker selected from the group consisting of: CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup>=CR<sup>4</sup>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>, CR<sup>4</sup>=CR<sup>4</sup>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>B, CR<sup>4</sup>=CR<sup>4</sup>B;

R<sup>4</sup> is independently selected in each occurrence -H,  
 15 -OR<sup>10</sup>, -COR<sup>9</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CONR<sup>9</sup>R<sup>10</sup>, -CN, -NR<sup>9</sup>R<sup>10</sup>, -S(O)<sub>n</sub>R<sup>12</sup>, halogen, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, aryl or heteroaryl, each optionally substituted with the following functional groups: -OR<sup>10</sup>, -COR<sup>9</sup>,  
 20 CO<sub>2</sub>R<sup>8</sup>, -CONR<sup>9</sup>R<sup>10</sup>, -CN, -NR<sup>9</sup>R<sup>10</sup>, -S(O)<sub>n</sub>R<sup>12</sup>, halogen, or two R<sup>4</sup> taken together form one or two carbonyl(s) or thiocarbonyl(s);

25 B is O, S(O)<sub>n</sub>, NR<sup>12</sup>;

A<sup>1</sup>-A<sup>4</sup> are CR<sup>5</sup>;

R<sup>5</sup> is independently at each occurrence -H,  
 30 C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>1</sub>-C<sub>4</sub> haloalkoxy, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, -NO<sub>2</sub>, halogen, -CN, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>COR<sup>7</sup>, -NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup>-OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO(NOR<sup>9</sup>)R<sup>11</sup>, -CO<sub>2</sub>R<sup>8</sup>, or  
 35 -S(O)<sub>n</sub>R<sup>11</sup>, where C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl and

C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl are optionally substituted with 1 to 3 substituents independently selected at each occurrence from C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>2</sub>-C<sub>4</sub> alkenyl, C<sub>2</sub>-C<sub>4</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NO<sub>2</sub>, halogen, -CN, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>COR<sup>7</sup>, -NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup>-OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CO(NOR<sup>9</sup>)R<sup>7</sup>, or -S(O)<sub>n</sub>R<sup>11</sup> and wherein two adjacent R<sup>5</sup> groups can form a 5-7 membered ring saturated or unsaturated optionally containing 1-2 O or SO<sub>n</sub> or 1-3 N heteroatoms optionally substituted with C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NO<sub>2</sub>, halogen, -CN, -NR<sup>6</sup>R<sup>7</sup>, NR<sup>6</sup>COR<sup>7</sup>, NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup>, -OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CO(NOR<sup>9</sup>)R<sup>7</sup>, or -S(O)<sub>n</sub>R<sup>11</sup> and not containing any S-S, O-O, S-O or N-S bonds in the ring;

R<sup>6</sup> and R<sup>7</sup> are independently at each occurrence H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>2</sub>-C<sub>8</sub> alkoxyalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub> alkyl)-, heteroaryl or heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl)-; or NR<sup>6</sup>R<sup>7</sup> is piperidine, pyrrolidine, piperazine, N-methylpiperazine, morpholine or thiomorpholine;

R<sup>8</sup> is independently at each occurrence C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub> alkyl), heteroaryl or heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl);

R<sup>9</sup> and R<sup>10</sup> are independently at each occurrence selected from H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> alkenyl, C<sub>3</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl;

- 5  $R^{11}$  is C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>2</sub>-C<sub>8</sub> alkoxyalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub> alkyl)-, heteroaryl or heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl), piperidine, pyrrolidine, piperazine, N-methylpiperazine, morpholine or thiomorpholine;
- 10  $R^{12}$  is C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> alkenyl, C<sub>3</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl;
- 15  $R^{13}$  and  $R^{14}$  are independently H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, aryl, aryl(C<sub>1</sub>-C<sub>4</sub> alkyl)-, heteroaryl or heteroaryl(C<sub>1</sub>-C<sub>4</sub> alkyl)-, -COR<sup>12</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CONR<sup>9</sup>, -S(O)<sub>n</sub>R<sup>12</sup>;
- 20 aryl is phenyl or naphthyl, each optionally substituted with 1 to 3 substituents independently selected at each occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl,
- 25 halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>10</sup>, SH, -S(O)<sub>n</sub>R<sup>12</sup>, -COR<sup>12</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>12</sup>, -NR<sup>9</sup>COR<sup>9</sup>, -N(COR<sup>12</sup>)<sub>2</sub>, -NR<sup>9</sup>CONR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>9</sup>R<sup>10</sup>, and -CONR<sup>9</sup>R<sup>10</sup>;
- 30 heteroaryl is pyridyl, pyrimidinyl, pyrazinyl, pyridazinyl, triazinyl, furanyl, quinolinyl, isoquinolinyl, thienyl, imidazolyl, thiazolyl, indolyl, pyrrolyl, oxazolyl, benzofuranyl, benzothienyl, benzthiazolyl, isoxazolyl,
- 35 pyrazolyl, triazolyl, tetrazolyl, or indazolyl, each optionally substituted with 1 to 3 substituents independently selected at each

occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>10</sup>, SH, -S(O)<sub>n</sub>R<sup>12</sup>, -COR<sup>12</sup>, -CO<sub>2</sub>R<sup>8</sup>, -  
5 OC(O)R<sup>12</sup>, -NR<sup>9</sup>COR<sup>9</sup>, -N(COR<sup>12</sup>)<sub>2</sub>, -NR<sup>9</sup>CONR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>CO<sub>2</sub>R<sup>8</sup>,  
-NR<sup>9</sup>R<sup>10</sup>, and -CONR<sup>9</sup>R<sup>10</sup>;

heterocyclyl is saturated or partially saturated  
10 heteroaryl, optionally substituted with 1 to 3 substituents independently selected at each occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -  
15 OR<sup>10</sup>, SH, -S(O)<sub>n</sub>R<sup>12</sup>, -COR<sup>12</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>12</sup>, -NR<sup>9</sup>COR<sup>9</sup>, -N(COR<sup>12</sup>)<sub>2</sub>, -NR<sup>9</sup>CONR<sup>9</sup>R<sup>10</sup>, -NR<sup>9</sup>CO<sub>2</sub>R<sup>8</sup>,  
-NR<sup>9</sup>R<sup>10</sup>, and -CONR<sup>9</sup>R<sup>10</sup>;

n is independently at each occurrence 0, 1 or 2;  
20

4. A compound of claim 1 and isomers thereof, stereoisomeric forms thereof, or mixtures of stereoisomeric forms thereof, and pharmaceutically  
25 acceptable salt forms thereof wherein Q is Ia and X is N.

5. A compound of claim 4 and isomers thereof, stereoisomeric forms thereof, or mixtures of stereoisomeric forms thereof, and pharmaceutically  
30 acceptable salt forms thereof wherein:

Y and Z are N or CR<sup>2</sup>;  
35

R<sup>1</sup> is independently at each occurrence -Me, -Et, halogen, -CN, -CF<sub>3</sub>, -OMe, -SMe, -NHMe, -NMe<sub>2</sub>,

-COMe, -SOMe, -SO<sub>2</sub>Me;

R<sup>2</sup> is -H, -Me, halogen;

5 R<sup>3</sup> is C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>8</sub> cycloalkyl or C<sub>4</sub>-C<sub>10</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>10</sub> alkoxyalkyl, cycloalkenyl, cycloalkenylalkyl, each optionally substituted with 1 to 3 substituents independently selected at each occurrence from  
 10 C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>7</sup>, -SH, -S(O)<sub>n</sub>R<sup>11</sup>, -COR<sup>6</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>10</sup>, -NR<sup>7</sup>COR<sup>6</sup>, -N(COR<sup>6</sup>)<sub>2</sub>, -NR<sup>7</sup>CONR<sup>6</sup>R<sup>7</sup>, -NR<sup>7</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>H, -CONR<sup>6</sup>R<sup>7</sup>;

15 L is CH<sub>2</sub>CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup>=CR<sup>4</sup>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>, CR<sup>4</sup>=CR<sup>4</sup>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>B, CR<sup>4</sup>=CR<sup>4</sup>B, where R<sup>4</sup> is H, or C<sub>1</sub>-C<sub>2</sub>, substituted with the following functional groups:  
 20 -CF<sub>3</sub>, -OMe, -COMe, -CO<sub>2</sub>Me, -CONHMe, -CN, -NMe<sub>2</sub>, -SMe, -SOMe, -SO<sub>2</sub>Me, halogen, or two R<sup>4</sup> taken together form a carbonyl;

B is O, S, SO, SO<sub>2</sub>, NH, NMe;

25 A<sup>1</sup>-A<sup>4</sup> are CR<sup>5</sup>,

R<sup>5</sup> is independently at each occurrence -H, C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>1</sub>-C<sub>4</sub> haloalkoxy, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-  
 30 C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl, -NO<sub>2</sub>, halogen, -CN, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>COR<sup>7</sup>, -NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup>-OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO(NOR<sup>9</sup>)R<sup>11</sup>, -CO<sub>2</sub>R<sup>8</sup>, or -S(O)<sub>n</sub>R<sup>11</sup>, where C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl and  
 35 C<sub>4</sub>-C<sub>12</sub> cycloalkylalkyl are optionally substituted with 1 to 3 substituents independently selected at each occurrence from



C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>2</sub>-C<sub>4</sub> alkenyl, C<sub>2</sub>-C<sub>4</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NO<sub>2</sub>, halogen, -CN, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>COR<sup>7</sup>, NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup> -OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>R<sup>8</sup>,  
5 -CO(NOR<sup>9</sup>)R<sup>7</sup>, or -S(O)<sub>n</sub>R<sup>11</sup> and wherein two adjacent R<sup>5</sup> groups can form a 5-7 membered ring saturated or unsaturated optionally containing 1-2 O or SO<sub>n</sub> or 1-3 N heteroatoms optionally substituted with C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl,  
10 C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NO<sub>2</sub>, halogen, -CN, -NR<sup>6</sup>R<sup>7</sup>, NR<sup>6</sup>COR<sup>7</sup>, NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup> -OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CO(NOR<sup>9</sup>)R<sup>7</sup>, or -S(O)<sub>n</sub>R<sup>11</sup> and not containing any S-S, O-O, S-O  
15 or N-S bonds in the ring;

R<sup>6</sup>, R<sup>7</sup>, R<sup>9</sup> and R<sup>10</sup> are independently at each occurrence selected from H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> alkenyl, C<sub>3</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl;  
20

R<sup>8</sup> is independently at each occurrence C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl;  
25

R<sup>11</sup> is C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> alkenyl, C<sub>3</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl;  
30

6. A compound of claim 4 and isomers thereof, stereoisomeric forms thereof, or mixtures of stereoisomeric forms thereof, and pharmaceutically acceptable salt or pro-drug forms thereof wherein:  
35

Y and Z are N;

R<sup>1</sup> is -Me or halogen;

R<sup>2</sup> is -H, -Me, halogen;

- 5 R<sup>3</sup> is C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>8</sub> cycloalkyl or C<sub>4</sub>-C<sub>10</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>10</sub> alkoxyalkyl, cycloalkenyl, cycloalkenylalkyl, each optionally substituted with 1 to 3 substituents independently selected at each occurrence from
- 10 C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>7</sup>, -SH, -S(O)<sub>n</sub>R<sup>11</sup>, -COR<sup>6</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>10</sup>, -NR<sup>7</sup>COR<sup>6</sup>, -N(COR<sup>6</sup>)<sub>2</sub>, -NR<sup>7</sup>CONR<sup>6</sup>R<sup>7</sup>, -NR<sup>7</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>6</sup>R<sup>7</sup>, -NHR<sup>6</sup>SO<sub>2</sub>R<sup>8</sup>, -CO<sub>2</sub>H,
- 15 -OC(O)NR<sup>6</sup>R<sup>7</sup>, -N<sub>3</sub>, -OC(O)OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>;

L is a linker selected from the group consisting of:  
CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>, CH<sub>2</sub>CH<sub>2</sub>, CH=CH, CH<sub>2</sub>CH<sub>2</sub>O;

- 20 A<sup>1</sup>, A<sup>2</sup>, A<sup>3</sup> and A<sup>4</sup> are carbon substituted independently at each occurrence with R<sup>5</sup>;

- R<sup>5</sup> is independently at each occurrence H, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl,
- 25 C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, C<sub>1</sub>-C<sub>4</sub> alkoxy, -NO<sub>2</sub>, halogen, -CN, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>COR<sup>7</sup>, -NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>11</sup> -OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO(NOR<sup>9</sup>)R<sup>11</sup>, -CO<sub>2</sub>R<sup>8</sup>, or -S(O)<sub>n</sub>R<sup>11</sup>;

- 30 R<sup>6</sup>, R<sup>7</sup>, and R<sup>9</sup> are independently at each occurrence selected from H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> alkenyl, C<sub>3</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl;

- 35 R<sup>8</sup>, R<sup>11</sup> are independently at each occurrence C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl;

7. A compound of claim 4 and isomers thereof,  
stereoisomeric forms thereof, or mixtures of  
5 stereoisomeric forms thereof, and pharmaceutically  
acceptable salt forms thereof, selected from the group  
consisting of:

(R,S)-4-(5,7-dibromo-2,3-dihydro-1H-indol-1-yl)-1-[1-  
10 methoxyethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]  
pyrimidine;

(R,S)-4-(5,7-dichloro-2,3-dihydro-4-indol-1-yl)-1-[1-  
methoxyethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]  
15 pyrimidine;

4-(7-chloro-5-methylsulfonyl-2,3-dihydro-4-indol-1-yl)-  
1-[1-methoxyethyl)propyl]-6-methyl-1H-1,2,3-  
triazolo[4,5-c] pyrimidine;

20 4-(7-chloro-5-methoxy-2,3-dihydro-4-indol-1-yl)-1-[1-  
methoxyethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]  
pyrimidine;

25 4-(7-chloro-5-methyl-2,3-dihydro-4-indol-1-yl)-1-[1-  
methoxyethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]  
pyrimidine;

30 4-(7-chloro-5-ethyl-2,3-dihydro-4-indol-1-yl)-1-[1-  
methoxyethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]  
pyrimidine;

35 4-(7-chloro-5-cyano-2,3-dihydro-4-indol-1-yl)-1-[1-  
methoxyethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]  
pyrimidine;

4-(5-acetyl-7-chloro-2,3-dihydro-4-indol-1-yl)-1-[1-methoxyethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyrimidine;

5 4-(7-chloro-5-thiomethyl-2,3-dihydro-4-indol-1-yl)-1-[1-methoxyethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c] pyrimidine; and

10 4-(7-chloro-5-methylsulfonyl-2,3-dihydro-4-indol-1-yl)-1-[1-methoxyethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c] pyrimidine.

8. A compound of claim 1 and isomers thereof,  
15 stereoisomeric forms thereof, or mixtures of stereoisomeric forms thereof, and pharmaceutically acceptable salt forms thereof wherein Q is Ia and X is CR<sup>1</sup>.

20

9. A compound of claim 8 and isomers thereof, stereoisomeric forms thereof, or mixtures of stereoisomeric forms thereof, and pharmaceutically acceptable salt forms thereof wherein:

25

Y and Z are N or CR<sup>2</sup>;

R<sup>1</sup> is independently at each occurrence -Me, -Et, halogen, -CN, -CF<sub>3</sub>, -OMe, -SMe, -NHMe, -NMe<sub>2</sub>,  
30 -COMe, -SOMe, -SO<sub>2</sub>Me;

R<sup>2</sup> is -H, -Me, halogen;

R<sup>3</sup> is C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl,  
35 C<sub>3</sub>-C<sub>8</sub> cycloalkyl or C<sub>4</sub>-C<sub>10</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>10</sub> alkoxyalkyl, cycloalkenyl, cycloalkenylalkyl, each

optionally substituted with 1 to 3 substituents independently selected at each occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>7</sup>, -SH, -S(O)<sub>n</sub>R<sup>11</sup>,  
 5 -COR<sup>6</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>10</sup>, -NR<sup>7</sup>COR<sup>6</sup>, -CO<sub>2</sub>H, -N(COR<sup>6</sup>)<sub>2</sub>, -NR<sup>7</sup>CONR<sup>6</sup>R<sup>7</sup>, -NR<sup>7</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>6</sup>R<sup>7</sup>, -NHR<sup>6</sup>SO<sub>2</sub>R<sup>8</sup>, -OC(O)NR<sup>6</sup>R<sup>7</sup>, -N<sub>3</sub>, -OC(O)OR<sup>7</sup> and -CONR<sup>6</sup>R<sup>7</sup>;

10

L is a linker selected from the group consisting of: CH<sub>2</sub>CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup>=CR<sup>4</sup>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>, CR<sup>4</sup>=CR<sup>4</sup>, CR<sup>4</sup><sub>2</sub>CR<sup>4</sup><sub>2</sub>B, CR<sup>4</sup>=CR<sup>4</sup>B, where R<sup>4</sup> is H, or C<sub>1</sub>-C<sub>2</sub>, substituted with the following functional groups:  
 15 -CF<sub>3</sub>, -OMe, -COMe, -CO<sub>2</sub>Me, -CONHMe, -CN, -NMe<sub>2</sub>, -SMe, -SOMe, -SO<sub>2</sub>Me, halogen, or two R<sup>4</sup> taken together form a carbonyl;

R<sup>4</sup> is independently selected in each occurrence -H, -OR<sup>10</sup>, -COR<sup>9</sup>, -CO<sub>2</sub>R<sup>8</sup>, -CONR<sup>9</sup>R<sup>10</sup>, -CN, -NR<sup>9</sup>R<sup>10</sup>,  
 20 -S(O)<sub>n</sub>R<sup>12</sup>, halogen, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, aryl or heteroaryl, each optionally substituted with the following functional groups: -OR<sup>10</sup>, -COR<sup>9</sup>,  
 25 CO<sub>2</sub>R<sup>8</sup>, -CONR<sup>9</sup>R<sup>10</sup>, -CN, -NR<sup>9</sup>R<sup>10</sup>, -S(O)<sub>n</sub>R<sup>12</sup>, halogen, or two R<sup>4</sup> taken together form one or two carbonyl(s) or thiocarbonyl(s);

30 B is O, S, SO, SO<sub>2</sub>, NH, NMe;

A<sup>1</sup>-A<sup>4</sup> are CR<sup>5</sup>,

R<sup>5</sup> is independently at each occurrence H, C<sub>1</sub>-  
 35 C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, -NO<sub>2</sub>, halogen, -CN, C<sub>1</sub>-

C<sub>4</sub> haloalkyl, -NR<sup>6</sup>R<sup>7</sup>, NR<sup>6</sup>COR<sup>7</sup>, NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>11</sup>  
-OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO(NOR<sup>9</sup>)R<sup>11</sup>, CO<sub>2</sub>R<sup>8</sup>, or -  
S(O)<sub>n</sub>R<sup>11</sup>, where C<sub>1</sub>-C<sub>6</sub> alkyl,  
C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl  
5 and C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl are optionally  
substituted with 1 to 3 substituents  
independently selected at each occurrence from  
C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>2</sub>-C<sub>4</sub> alkenyl, C<sub>2</sub>-C<sub>4</sub> alkynyl, C<sub>3</sub>-  
C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, C<sub>1</sub>-C<sub>4</sub>  
10 haloalkyl, -NO<sub>2</sub>, halo, -CN, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>COR<sup>7</sup>,  
NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>6</sup> -OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, CO<sub>2</sub>R<sup>8</sup>,  
-CO(NOR<sup>9</sup>)R<sup>7</sup> and -S(O)<sub>n</sub>R<sup>11</sup>;

R<sup>6</sup>, R<sup>7</sup>, R<sup>9</sup> and R<sup>10</sup> are independently at each  
15 occurrence selected from H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub>  
haloalkyl, C<sub>3</sub>-C<sub>6</sub> alkenyl, C<sub>3</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub>  
cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl;

R<sup>8</sup> is independently at each occurrence C<sub>1</sub>-C<sub>4</sub> alkyl,  
20 C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl,  
C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl;

R<sup>11</sup> is C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> alkenyl,  
C<sub>3</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub>  
25 cycloalkylalkyl.

10. A compound of claim 8 and isomers thereof,  
stereoisomeric forms thereof, or mixtures of  
stereoisomeric forms thereof, and pharmaceutically  
30 acceptable salt forms thereof wherein:

Y and Z are N;

R<sup>1</sup> is -Me or halogen;  
35

R<sup>2</sup> is -H, -Me, halogen;

R<sup>3</sup> is C<sub>1</sub>-C<sub>10</sub> alkyl, C<sub>2</sub>-C<sub>10</sub> alkenyl, C<sub>2</sub>-C<sub>10</sub> alkynyl, C<sub>3</sub>-C<sub>8</sub> cycloalkyl or C<sub>4</sub>-C<sub>10</sub> cycloalkylalkyl, C<sub>2</sub>-C<sub>10</sub> alkoxyalkyl, cycloalkenyl, cycloalkenylalkyl, each optionally substituted with 1 to 3 substituents independently selected at each occurrence from C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, halogen, C<sub>1</sub>-C<sub>4</sub> haloalkyl, cyano, -OR<sup>7</sup>, -SH, -S(O)<sub>n</sub>R<sup>11</sup>, -COR<sup>6</sup>, -CO<sub>2</sub>R<sup>8</sup>, -OC(O)R<sup>10</sup>, -NR<sup>7</sup>COR<sup>6</sup>, -N(COR<sup>6</sup>)<sub>2</sub>, -NR<sup>7</sup>CONR<sup>6</sup>R<sup>7</sup>, -NR<sup>7</sup>CO<sub>2</sub>R<sup>8</sup>, -NR<sup>6</sup>R<sup>7</sup>, -CO<sub>2</sub>H, -NHR<sup>6</sup>SO<sub>2</sub>R<sup>8</sup>, -OC(O)NR<sup>6</sup>R<sup>7</sup>, -N<sub>3</sub>, -OC(O)OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>;

L is a linker selected from the group consisting of: CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>, CH<sub>2</sub>CH<sub>2</sub>, CH=CH, CH<sub>2</sub>CH<sub>2</sub>O;

A<sup>1</sup>, A<sup>2</sup>, A<sup>3</sup> and A<sup>4</sup> are carbon substituted independently at each occurrence with R<sup>5</sup>;

R<sup>5</sup> is independently at each occurrence H, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>2</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl, C<sub>1</sub>-C<sub>4</sub> alkoxy, -NO<sub>2</sub>, halogen, -CN, C<sub>1</sub>-C<sub>4</sub> haloalkyl, -NR<sup>6</sup>R<sup>7</sup>, -NR<sup>6</sup>COR<sup>7</sup>, -NR<sup>6</sup>CO<sub>2</sub>R<sup>8</sup>, -COR<sup>11</sup> -OR<sup>7</sup>, -CONR<sup>6</sup>R<sup>7</sup>, -CO(NOR<sup>9</sup>)R<sup>11</sup>, -CO<sub>2</sub>R<sup>8</sup>, or -S(O)<sub>n</sub>R<sup>11</sup>;

R<sup>6</sup>, R<sup>7</sup>, and R<sup>9</sup> are independently at each occurrence selected from H, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> alkenyl, C<sub>3</sub>-C<sub>6</sub> alkynyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>7</sub> cycloalkylalkyl;

R<sup>8</sup>, R<sup>11</sup> are independently at each occurrence C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>1</sub>-C<sub>4</sub> haloalkyl, C<sub>3</sub>-C<sub>6</sub> cycloalkyl, C<sub>4</sub>-C<sub>8</sub> cycloalkylalkyl;

11. A compound of claim 8 and isomers thereof, stereoisomeric forms thereof, or mixtures of

stereoisomeric forms thereof, and pharmaceutically-acceptable salt forms thereof, selected from the group consisting of:

- 5 (S)-4-(5,7-dibromo-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- (R,S)-4-(5,7-dibromo-2,3-dihydro-1H-indol-1-yl)-1-[1-  
10 (methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- (R,S)-4-(5,7-dibromo-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-  
15 c]pyridine;
- 4-(5,7-dimethoxy-2,3-dihydro-1H-indol-1-yl)-1-[1-ethylpropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- 20 (R,S)-4-(5-bromo-7-methoxy-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- (R,S)-4-(5-bromo-7-methoxy-2,3-dihydro-1H-indol-1-yl)-  
25 1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;
- (R,S)-4-(5-bromo-7-methyl-2,3-dihydro-1H-indolyl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]  
30 pyridine;
- (R,S)-4-(5-bromo-7-chloro-2,3-dihydro-1H-indol-1-yl)-1-[1-methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

35



(R,S)-4-(5-bromo-7-chloro-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

5 (R,S)-4-(7-chloro-5-methoxy-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

10 (S)-4-(7-chloro-5-methoxy-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

15 (R,S)-4-(7-chloro-5-methyl-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

20 (R,S)-4-(7-chloro-5-ethyl-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

(R,S)-4-(7-chloro-5-cyano-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

25 (R,S)-4-(7-chloro-5-thiomethyl-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

30 (R,S)-4-(7-chloro-5-methoxy-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

35 (R,S)-4-(7-chloro-5-methyl-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

(R,S)-4-(7-chloro-5-ethyl-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

5 (R,S)-4-(7-chloro-5-cyano-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

4-(7-chloro-5-thiomethyl-2,3-dihydro-1H-indol-1-yl)-1-  
10 (1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

4-(7-chloro-5-methylsulfonyl-2,3-dihydro-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;  
15

4-(7-chloro-5-methoxy-2,3-dihydro-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

20 4-(7-chloro-5-methyl-2,3-dihydro-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

4-(7-chloro-5-ethyl-2,3-dihydro-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;  
25

4-(7-chloro-5-cyano-2,3-dihydro-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

4-(5-acetyl-7-chloro-2,3-dihydro-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;  
30

4-(7-chloro-5-methylsulfonyl-2,3-dihydro-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;  
35

4-(5,7-dichloro-2,3-dihydro-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

(R,S)-4-(5,7-dichloro-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

5

(R,S)-4-(5,7-dichloro-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxymethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

10 4-(5,7-dichloro-2,3-dihydro-1H-indol-1-yl)-1-[1-(methoxyethyl)-3-methoxypropyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

15 (R,S)-4-(5,7-dichloro-2,3-dihydro-1H-indol-1-yl)-1-[1-(cyanomethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

N-(7-chloro-5-methoxy-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

20

N-(7-chloro-5-methyl-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

25 N-(7-chloro-5-ethyl-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

N-(7-chloro-5-cyano-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

30 N-(5-acetyl-7-chloro-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

N-(7-chloro-5-thiomethyl-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

35

N-(7-chloro-5-methylsulfonyl-1H-indol-1-yl)-1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridine;

- (R,S)-8-chloro-1,2,3,4-tetrahydro-1-[1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline;
- 5 (R,S)-8-bromo-1,2,3,4-tetrahydro-1-[1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline;
- 10 (R,S)-8-chloro-6-methoxy-1,2,3,4-tetrahydro-1-[1-[1-(methoxymethyl)propyl]-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline;
- 15 (R,S)-8-chloro-6-cyano-1,2,3,4-tetrahydro-1-[1-[1-(methoxymethyl)propyl]-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline;
- 20 (R,S)-8-chloro-1,2,3,4-tetrahydro-1-[1-[1-(methoxymethyl)propyl]-6-methylsulfonyl-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline;
- 25 8-chloro-1,2,3,4-tetrahydro-1-[1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline;
- 30 8-bromo-1,2,3,4-tetrahydro-1-[1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline;
- 35 8-chloro-1,2,3,4-tetrahydro-1-[1-(1-ethylpropyl)-6-methoxy-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline;
- 8-chloro-6-cyano-1,2,3,4-tetrahydro-1-[1-(1-ethylpropyl)-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline;

8-chloro-1,2,3,4-tetrahydro-1-[1-(1-ethylpropyl)-6-methylsulfonyl-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline;

- 5 6-acetyl-8-chloro-1,2,3,4-tetrahydro-1-[1-(1-ethylpropyl)-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-6-methylquinoline; and

- 10 (R,S)-5-bromo-3,4-dihydro-4-[1-[1-(methoxymethyl)propyl]-6-methyl-1H-1,2,3-triazolo[4,5-c]pyridin-4-yl]-7-methyl-2H-1,4-benzoxazine.

12. A pharmaceutical composition comprising a  
15 pharmaceutically acceptable carrier and a therapeutically effective amount of a compound of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or 11.

- 20 13. A method of treating affective disorder, anxiety, depression, headache, irritable bowel syndrome, post-traumatic stress disorder, supranuclear palsy, immune suppression, Alzheimer's disease, gastrointestinal diseases, anorexia nervosa or other feeding disorder,  
25 drug addiction, drug or alcohol withdrawal symptoms, inflammatory diseases, cardiovascular or heart-related diseases, fertility problems, human immunodeficiency virus infections, hemorrhagic stress, obesity, infertility, head and spinal cord traumas, epilepsy,  
30 stroke, ulcers, amyotrophic lateral sclerosis, hypoglycemia or a disorder the treatment of which can be effected or facilitated by antagonizing CRF, including but not limited to disorders induced or facilitated by CRF, in mammals, comprising:  
35 administering to the mammal a therapeutically effective amount of a compound of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or 11.

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 C07D471/04 C07D487/04 A61K31/44 A61K31/505

/(C07D471/04,249:00,221:00),(C07D487/04,249:00,239:00),  
(C07D487/04,239:00,231:00)

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 C07D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 95 34563 A (PFIZER INC.) 21 December 1995 cited in the application see claims 1,12 ---	1-12
Y	WO 94 13677 A (PFIZER INC.) 23 June 1994 cited in the application see claims 1,11 ---	1-12
Y	WO 95 33750 A (PFIZER INC.) 14 December 1995 cited in the application see claims 1,13 ---	1-12
Y	EP 0 778 277 A (PFIZER INC.) 11 June 1997 cited in the application see claims 1,16-18 --- -/--	1-12



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

## \* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&amp;" document member of the same patent family

Date of the actual completion of the international search

3 December 1998.

Date of mailing of the international search report

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	WO 95 33727 A (PFIZER INC.) 14 December 1995 cited in the application see claims 1,20 ---	1-12
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Y	EP 0 385 850 A (LABORATOIRES UPSA) 5 September 1990 see claims 1,21-23 & CA 2 011 222 A cited in the application ---	1-12
A	US 5 378 700 A (Y. SAKUMA ET AL.) 3 January 1995 cited in the application see claims 1,2 ---	1-12
A	WO 97 27199 A (NOVARTIS AG) 31 July 1997 cited in the application see claims 1,9,10 ---	1-12
A	WO 96 40142 A (PFIZER INC.) 19 December 1996 cited in the application see claims 1,25; examples 7,9 -----	1-12

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